RevMexAA (Serie de Conferencias), **44**, 129–225 (2014)

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

ABSTRACTS

PLANETARY SYSTEMS

THE USE OF THE MATHEMATICA SOFTWARE IN THE STUDY OF PLANETARY DYNAMICS

N. F. Aguero[1] and T. A. Michtchenko[2]

This work presents a study on how techniques provided by the algebraic manipulation software Mathematica can be used in planetary dynamics investigations. The discovery of extra-solar planets orbiting other stars has been one of the major breakthroughs in astronomy of the past decades, changing our view on the features of planetary systems, mainly drawn from the observation of the Solar System. Today, over 1000 exoplanets are known and the Kepler satellite has recently identified over 3000 additional candidates, most of them still waiting for confirmation. We have learned that exoplanets are much more diverse when compared to our own Solar System. Thus, the implementation of advanced manipulation techniques can be of great importance for the investigation of such unusual configurations of these new worlds. We chose Mathematica, a software that has been increasingly used worldwide due to its great analysis power.

The case that we focus is the 2/1 mean-motion resonance in the two-planet systems. Based on the Mathematica platform, we present animations of the orbits of the Neptune-Pluto system and exoplanets in the 2:1 mean-motion resonance over a short-period of time. The visualization of this problem can be very important to an initial understanding of dynamical proprieties of resonant planetary systems and their stability.

[1] IAG-USP - Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo (nfaguero@gmail.com).
[2] IAG-USP - Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo (tatiana@astro.iag.usp.br).

A DYNAMICAL MECHANISM TO PRODUCE HIGH-INCLINATIONS TNOS

P. I. O. Brasil[1,2], R. S. Gomes[2,3], and D. Nesvorný[2]

We discuss the dynamical formation of small Solar System objects beyond Neptune. The discovery of the first trans-Neptunian object (TNO) − except for Pluto and Charon − is relatively recent ($1992QB_1$). Many unpredicted dynamical and physical features not predicted in past theoretical models and are now showing up. Among them, we note the existence of many high-inclined orbits with respect to the eclipitc plane (where all Solar System bodies supposedly have formed).

The aim of this work is to show a dynamical pathway from the primordial planetesimal disk to high inclinations orbits in the trans-Neptunian region. The main mechanism requires that scattered planetesimals are captured into some exterior mean motion resonance (MMR) with Neptune and then be trapped into the Kozai resonance as well. After that, some planetesimals may access a resonance *hibernating mode* in which the planesimal is barely locked in resonance. We show that only a few percent of all scattered planetesimals would access the hibernating mode. But, once this mechanism is active, $\sim 100\%$ of the particles would escape both resonances while Neptune is in its final migration stage (after the LHB phase).

Our results could explain at least a portion (up to 80%) of the classical *hot* population, defined by $a_{2:3} < a < a_{1:2}$, $i > 5^o$, and $q > 36au$. Previous results indicate that this mechanism is the most likely to form the *detached objects* close to MMR with Neptune as, for example, $2004XR_{190}$ (Gomes, 2011, Icarus 215, 661). We have determined the most probable regions, in the orbital elements space (a, e, i), where detached objects would form close to 2:5 and 1:3 MMRs (Brasil, Gomes & Soares, 2013 - *submitted to A&A*).

[1] Instituto Nacional de Pesquisas Espaciais, Divisão de Mecânica Espacial e Controle - INPE/DMC.
[2] Southwest Research Institute, Departments of Space Studies and Space Operations - SwRI/DSSSO.
[3] Observatório Nacional, Grupo de Pesquisa em Astromomia - ON/GPA.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

STABLE LOW-ALTITUDE ORBITS AROUND GANYMEDE CONSIDERING A DISTURBING BODY IN A CIRCULAR ORBIT

J. Cardoso dos Santos[1], J. P. S. Carvalho[2], and R. V. de Moraes[2]

Some missions are being planned to visit Ganymede like the Europa Jupiter System Mission that is a cooperation between NASA and ESA to insert the spacecraft JGO (Jupiter Ganymede Orbiter) into Ganymedes orbit. This comprehension of the dynamics of these orbits around this planetary satellite is essential for the success of this type of mission. Thus, this work aims to perform a search for low-altitude orbits around Ganymede. An emphasis is given in polar orbits and it can be useful in the planning of space missions to be conducted around, with respect to the stability of orbits of artificial satellites. The study considers orbits of artificial satellites around Ganymede under the influence of the third-body (Jupiter's gravitational attraction) and the polygenic perturbations like those due to non-uniform distribution of mass (J_2 and J_3) of the main body. A simplified dynamic model for these perturbations is used. The Lagrange planetary equations are used to describe the orbital motion of the artificial satellite. The equations of motion are developed in closed form to avoid expansions in eccentricity and inclination. The results show the argument of pericenter circulating. However, low-altitude (100 and 150 km) polar orbits are stable. Another orbital elements behaved variating with small amplitudes. Thus, such orbits are convenient to be applied to future space missions to Ganymede. Acknowledgments: FAPESP (processes n° 2011/05671-5, 2012/12539-9 and 2012/21023-6).

[1] Group on Orbital Dynamics and Planetology, São Paulo State University (UNESP), Guaratinguetá, Brazil. (josuesantosunesp@gmail.com).
[2] Institute of Science and Technology, Federal University of São Paulo (UNIFESP), São José dos Campos, Brazil.

TIDAL, THERMAL AND MAGNETIC EVOLUTION OF TERRESTRIAL EXOPLANETS IN THE HABITABLE ZONE OF DWARF STARS

P. Cuartas-Restrepo[1], M. Melita[2], J. Zuluaga[1], J. Hoyos[3], and M. Sucerquia[1]

The rotation and thermal evolution of a planet plays a main role in the planetary magnetic field evolution. The rotation period determines properties like the regime of the planetary dynamo and its intensity. This is crucial for a planet to keep its reservoir of volatile material like water, protected against the erosive action of the stellar wind and cosmic rays. Planets orbiting dwarf stars are tidally affected by their host, this determines the final rotation period (resonance) or the tidal locking of the planet, especially during the very first Myr. At the same time this first period of the planet history is the most affected by the magnetic activity of the host star. We calculate the rotation and tidal evolution of planets and combine this with a thermal evolution model to know how this very first stages of the planetary evolution finish with an stable and protective planetary magnetic field or with an unprotected planet.

[1] Instituto de Física - FCEN, Universidad de Antioquia, Medellín, Colombia.
[2] Instituto de Astronomía y Física del Espacio - IAFE, Buenos Aires, Argentina.
[3] Departamento de Ciencias Básicas, Universidad de Medellín, Medellín, Colombia.

IMPROVEMENT OF TNO'S EPHEMERIS IN THE CONTEXT OF STELLAR OCCULTATIONS

J. Desmars[1], F. Braga-Ribas[1], R. Vieira-Martins[1], J. I. B. Camargo[1], and M. Assafin[2]

Trans-Neptunian Objects are distant, faint and poorly known solar system objects. Stellar occultations are currently, the only way to precisely determine some physical characteristics of these objects, such as the shape/size, the multiplicity or an eventual atmosphere. The prediction of stellar occultations requires both accurate astrometry of stars and accurate ephemeris.

The current methods of prediction use a constant offset compared to JPL ephemeris. The offset is calculated from the most recent observations as the mean difference between observations and the ephemeris. This method assumes that the offset remains constant over a certain period.

In this study, we perform a new ephemeris with available observations and observations done for offset determination. In this context, we have developed a dynamical model of the motion of asteroids

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

(NIMA), fitted to observations and determined a new ephemeris.

The difference between NIMA and JPL ephemerides is close to the offset at the date of observations but this difference then varies over time, according to a periodic one-year term and a secular term. For some objects, the offset method may remain accurate when the time between observations and occultation is short or when the offset's variations remain small. For other TNOs, the difference sharply increases making inaccurate predictions in the future. Consequently, new ephemerides should be used to make predictions. Finally, occultations also provide accurate astrometric positions and therefore new constraints on the TNO's motion. We analyze the contribution of previous occultations in the improvement of TNO'S ephemerides.

[1] Observatório Nacional/MCTI, Brazil.
[2] Observatório do Valongo/UFRJ, Brazil.

SMALL ASTEROID FRAGMENTS IN EARTH-CROSSING ORBITS

J. Duha[1] and G. B. Afonso[2]

The meteorite that fell in Chelyabinsk, Russia, naturally made many people think it could be a smaller companion of the Asteroid 2012 DA14, which passed close to Earth on that same day. Some asteroid specialists discarded this hypothesis for two main reasons: The meteorite was too far away from the asteroid, because the collision happened sixteen hours before the asteroid passed close to Earth. Moreover, it was not traveling, similarly to asteroid DA14, from south to north. However the possibility of the meteorite being a companion of the Asteroid 2012 DA14 cannot be completely discarded. The Asteroid 2012 DA14, with a diameter of 45 meters, is very small. It can be considered an asteroids fragment, which is usually accompanied by other smaller fragments, scattered in space, practically in the same orbit and possibly being separated from each other by long distances. Assuming that 2012 DA14 is not an isolated asteroid, but the biggest remaining fragment from a previous impact, we developed a model to study the dynamics of an asteroid fragment, similar to DA14, and its companions, the smaller fragments. This dynamically interesting encounter with planet Earth is addressed and the orbital changes that could explain the Chelyabinsk event are discussed. As a result we find that, there could be a collision of a meteorite before, during, or after the Asteroid 2012 DA14 passing by, the same way that happens with meteorite showers, which can last several days. Therefore, it would be very interesting to look for asteroid fragments also, close to the larger fragments, more easily found.

[1] Federal Institute of Parana - IFPR, Brazil(jania.duha@ifpr.edu.br).
[2] Federal Institute of Amazonas - IFAM, Brazil.

ATLAS OF THE THREE BODY RESONANCES IN THE SOLAR SYSTEM

T. Gallardo[1]

Three body resonances (TBRs) between a massless particle with an arbitrary orbit and two planets P_1 and P_2 in circular coplanar orbits occur when the critical angle $\sigma = k_0\lambda_0+k_1\lambda_1+k_2\lambda_2-(k_0+k_1+k_2)\varpi_0$ being k_i integers is oscillating over time. The approximate localization in semimajor axis of the TBRs taking arbitrary pairs of planets is very simple, specially if we ignore the secular motion of the perihelion and nodes of the perturbing planets. When these slow secular motions are taken into account each of the nominal three body resonances split in a family of resonances all them very near the nominal one. The challenge is to obtain the width, strength or whatever that give us the dynamical relevance of these TBRs. We propose an algorithm to numerically estimate the strength of arbitrary TBRs between two planets in circular coplanar orbits and a massless particle in an arbitrary orbit. This algorithm allowed us to obtain an atlas of the TBRs in the Solar System showing where are located and how strong are thousands of TBRs involving all the planets from 0 to 1000 au. Relevant results for the population of asteroids and transneptunian objects will be presented.

[1] Facultad de Ciencias, Universidad de la República, Uruguay.

DYNAMICAL EVOLUTION OF DIFFERENTIATED ASTEROID FAMILIES

W. S. Martins-Filho[1], J. Carvano[1], T. Mothe-Diniz[2], and F. Roig[1]

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

The project aims to study the dynamical evolution of a family of asteroids formed from a fully differentiated parent body, considering family members with different physical properties consistent with what is expected from the break up of a body formed by a metallic nucleus surrounded by a rocky mantle. Initially, we study the effects of variations in density, bond albedo, and thermal inertia in the semi-major axis drift caused by the Yarkovsky effect. The Yarkovsky effect is a non-conservative force caused by the thermal re-radiation of the solar radiation by an irregular body. In Solar System bodies, it is known to cause changes in the orbital motions (Peterson, 1976), eventually bringing asteroids into transport routes to near-Earth space, such as some mean motion resonances. We expressed the equations of variation of the semi-major axis directly in terms of physical properties (such as the mean motion, frequency of rotation, conductivity, thermal parameter, specific heat, obliquity and bond albedo). This development was based on the original formalism for the Yarkovsky effect (i.e., Bottke et al., 2006 and references therein). The derivation of above equations allowed us to closely study the variation of the semi-major axis individually for each physical parameter, clearly showing that the changes in semi-major axis for silicate bodies is twice or three times greater than for metal bodies. The next step was to calculate the orbital elements of a synthetic family after the break-up. That was accomplished assuming that the catastrophic disruption energy is given by the formalism described by Stewart and Leinhardt (2009) and assuming an isotropic distribution of velocities for the fragments of the nucleus and the mantle. Finally, the orbital evolution of the fragments is implemented using a simpletic integrator, and the result compared with the distribution of real asteroid families.

[1] Observatório Nacional, Rua General José Cristino 77, São Cristóvão, Rio de Janeiro/RJ, Brazil (walter@on.br).
[2] Observatório do Valongo/UFRJ.

THE EVOLUTION OF THE G RING ARC UNDER THE EFFECTS OF THE RESONANCE WITH MIMAS AND THE SOLAR RADIATION FORCE

D. C. Mourão[1], S. M. Giuliatti Winter[1], and R. Sfair[1]

The small satellite Aegaeon, less than 1km across, is embedded in an arc located in the G ring of Saturn. This satellite belong to a new class of structures imaged by the Cassini spacecraft, which is formed by small satellites immersed in arcs. Aegaeon is also locked in a 7:6 corotation resonance with the satellite Mimas. It has been proposed that Aegaoen, along with a set of large particles located in this arc, is responsible for the maintenance of the G ring against dissipative forces. In this work, we study the orbital evolution of a sample of tiny particles (sizes ranging from 1 to 100m) under the gravitational effects of Mimas and the solar radiation pressure. These particles were initially spread both along the ring, about ± 20 km from the semimajor axis resonance of Aegaeon, and close to the Aegaeon's surface. Our results show that, despite the particles are initially in a corotation resonance with Mimas, the effects of the solar radiation pressure remove by collision with Aegaeon most of smallest particles from the arc in a timespan of 100yrs. The remaining particles stay confined in the G ring.

[1] Univ. Estadual Paulista - UNESP, Campus Guaratinguetá, Av Ariberto Pereira da Cunha, 333 , CEP 12516-410, Guaratinguetá, SP, Brazil. (decio@feg.unesp.br).

THE BEHAVIOR OF REGULAR SATELLITES DURING THE NICE MODEL'S PLANETARY CLOSE ENCOUNTERS

E. C. Nogueira[1,2], R. S. Gomes[2], and R. Brasser[3]

In order to explain the behavior of the regular satellites of the ice planets during the instability phase of the Nice model, we used numerical simulations to investigate the evolution of the satellite systems when these two planets experienced encounters with the gas giants. For the initial conditions we placed an ice planet in between Jupiter and Saturn, according to the evolution of Nice model simulations in a jumping Jupiter scenario (Brasser et al. 2009). We used the MERCURY integrator (Chambers 1999) and we obtained 101 successful runs which kept all planets, of which 24 were jumping Jupiter cases. Subsequently we performed additional numerical integrations in which the ice giant that encountered a gas giant was started on the same orbit but with its regular satellites included. This is done as follows: For each of the 101 basic runs, we save the orbital elements of all objects in the integration at all close encounter events. Then we performed a backward integration to start the system 100 years before the encounter

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

and re-enacted the forward integration with the regular satellites around the ice giant. The final orbital elements of the satellites with respect to the ice planet were used to restart the integration for the next planetary encounter. If we assume that Uranus is the ice planet that had encounters with a gas giant, we considered the satellites Miranda, Ariel, Umbriel, Titania and Oberon with their present orbits. For Neptune we introduced Triton with an orbit with a 15% larger than the actual semi-major axis to account for the tidal decay from the LHB to present time. We also assume that Triton was captured through binary disruption (Agnor and Hamilton 2006, Nogueira et al. 2011) and its orbit was circularized by tides during the 500 million years before the LHB.

[1] Universidade Federal Fluminense, Brasil.
[2] Observatório Nacional, Brasil.
[3] Academia Sinica, Taiwan.

THE MOST COMMON HABITABLE PLANETS ATMOSPHERIC CHARACTERIZATION OF THE SUBGROUP OF FAST ROTATORS

R. Pinotti[1]

The current search for habitable planets has focused on Earth-like conditions of mass, volatile content and orbit. However, rocky planets following eccentric orbits, and drier than the Earth, may be a more common phenomenon in the Universe. For the subgroup of fast rotators, it is suggested that their atmospheric thermal capacitance, subjected to the radiative forcing of their parent stars, may provide researchers in the near future with a simple method for the determination of a robust lower limit of atmospheric thickness. This technique, together with the spectroscopic analysis of resolved planets from their stars, both allowed by planned space and ground-based observatories with thermal infrared capabilities, would enable us with a better understanding of the habitability of this class of planets. The technique works better for shorter orbital periods, but since the tidal-lock radius of M dwarfs encompasses their Habitable Zone (HZ), the optimum targets would be planets around K dwarf stars. The atmospheric thermal capacitance could also expand the range of HZs for shorter orbits, particularly for planets around M dwarf stars, since the higher frequency of the periodic radiative forcing dampens the surface temperature variation considerably.

[1] Observatorio do Valongo, Universidade Federal do Rio de Janeiro, Ladeira Pedro Antonio 43, Rio de Janeiro, Brasil, 20080-090 (rpinotti@astro.ufrj.br).

SPIN-ORBIT RESONANCES IN SUPER-EARTH SYSTEMS CLOSE TO MEAN-MOTION COMMENSURABILITIES

F. B. Ribeiro[1] and N. Callegari Jr.[2]

There is a great deal of planets in close-in orbits and low mass on order of magnitude less than 10 Earth mass. Valencia et al. (2006) call them Super-Earths. Recently, several efforts have been done in order to understand the dynamics of rotation of these planets, including spin-orbit resonance and spin tidal evolution (Rodríguez et al. (2012), Callegari and Rodríguez (2013)). In the referred papers, it is considered a single planet whose motion around the star is governed by the rules of the two-body problem. However, many Super-Earths are present in systems where other terrestrial or giant planets are present, and that problem must be checked. In this work we study the dynamical effects of mean-motion commensurabilities on rigid body rotation and spin-orbit resonances. Emphasis is given in the cases of the multi-planetary systems Kepler-11, KOI-55 and KOI-961, where the mean motions of several pairs of planets are commensurable. In some cases we have observed that the period associated to a particular commensurability is close to the period of the free libration of the rotation of one of the super-Earths. Thus, we investigate the role of the mean motion resonance on the synchronous rotation. Depending on the initial conditions inside the synchronous domain, the stable librations induced by the torque of the central star on the figure of the planet can lead to instabilities on its rotation which are not expected in such regular regions of rotational phase space. This phenomenon has been observed in the cases of Kepler-11 b (disturbed by Kepler-11 c), KOI-55 b (disturbed by KOI-55 c), KOI-961c (disturbed by KOI-961b and KOI-961d).

[1] Physics Department, Universidade Estadual Paulista Júlio de Mesquita Filho, Avenida 24 A, 1515, CEP 13506-900, Rio Claro, São Paulo, Brazil (filipebr7@gmail.com).
[2] DEMAC, Universidade Estadual Paulista Júlio de Mesquita Filho, Avenida 24 A, 1515 CEP 13506-900, Rio Claro, São Paulo, Brazil.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

THE SNC METEORITES

M. E. Varela[1]

The SNC (Shergotty-Nakhla-Chassigny) group, are achondritic meteorites. Of all SNC meteorites recognized up to date, shergottites are the most abundant group. The petrographic study of Shergotty began several years ago when Tschermak, (1872) identified this rock as an extraterrestrial basalt. Oxygen isotopes in SNC meteorites indicate that these rocks are from a single planetary body (Clayton and Mayeda, 1983). Because the abundance patterns of rare gases trapped in glasses from shock melts (e.g., Pepin, 1985) turned out to be very similar to the Martian atmosphere (as analyzed by the Viking landers, Owen, 1976), the SNC meteorites are believed to originate from Mars (e.g. McSween, 1994). Possibly, they were ejected from the Martian surface either in a giant impact or in several impact events (Meyer 2006). Although there is a broad consensus for nakhlites and chassignites being -1.3Ga old, the age of the shergottites is a matter of ongoing debates. Different lines of evidences indicate that these rocks are young (180Ma and 330-475Ma), or very old (> 4Ga). However, the young age in shergottites could be the result of a resetting of these chronometers by either strong impacts or fluid percolation on these rocks (Bouvier et al., 2005-2009). Thus, it is important to check the presence of secondary processes, such as re-equilibration or pressure-induce metamorphism (El Goresy et al., 2013) that can produce major changes in compositions and obscure the primary information. A useful tool, that is used to reconstruct the condition prevailing during the formation of early phases or the secondary processes to which the rock was exposed, is the study of glass-bearing inclusions hosted by different mineral phases. I will discuss the identification of extreme compositional variations in many of these inclusions (Varela et al. 2007-2013) that constrain the assumption that these objects are the result of closed-system crystallization. The question then arises whether these inclusions can be considered reliable samples of the fluid/melt that was originally trapped.

[1] Instituto de Ciencias Astronómica de la Tierra y del Espacio (ICATE).

MORPHOLOGICAL ANALYSIS OF THE TAIL STRUCTURES OF COMET 1P/HALLEY 1910 II

M. R. Voelzke[1] and L. S. Izaguirre[1]

Eight hundred and eighty six images from September 1909 to May 1911 are analysed for the purpose of identifying and measuring the morphological structures along the plasma tail of 1P/Halley. These images are from the Atlas of Comet Halley 1910 II. A systematic visual analysis revealed 304 wavy structures along the main tail and 164 along the secondary tails, 41 solitons, 13 Swan-like tails, 26 disconnection events (DEs), 166 knots and six shells. In general, it is possible to associate the occurrence of a DE and/or a Swan-Tail with the occurrence of a knot, but the last one may occur independently. It is also possible to say that the solitons occur in association with the wavy structures, but the reverse is not true. The 26 DEs documented in 26 different images allowed the derivation of two onsets of DEs. Both onsets of DEs were determined after the perihelion passage with an average of the corrected velocities Vc equal to (57 $\pm$ 15) km/s. The mean value of the corrected wavelength lc measured in 70 different wavy structures is equal to (1.7 $\pm$ 0.1) x 10^6 km and the mean amplitude A of the wave (measured in the same 70 wavy structures cited above) is equal to (1.4 $\pm$ 0.1) x 10^5 km. The mean value of the corrected cometocentric phase velocity Vpc measured in 20 different wavy structures is equal to (168 $\pm$ 28) km/s. The average value of the corrected velocities Vkc of the knots measured in 36 different images is equal to (128 $\pm$ 12) km/s. There is a tendency for A and lc to increase with increasing cometocentric distance.

[1] Cruzeiro do Sul University, Campus Liberdade, Galvão Bueno Street 868, 01506-000, São Paulo, SP, Brazil. (mrvoelzke@hotmail.com).

INTERSTELLAR MEDIUM

DENSITY STRATIFICATION EFFECTS ON THE 3D MODELING OF THE BIPOLAR NEBULA NGC 2346

C. M. Carneiro[1] and D. R. Gonçalves[1]

The study of planetary nebulae (PNe) is extremely important in order to understand the evolution of low- and intermediate-mass stars. Photoionization codes intent to reproduce the interactions of the central star's radiation with the nebular gas. By using this tool, we are able to determine the physical properties of both: nebula and central star. About 70% of the PNe are ellipticals and bipolars and 20% have round morphologies. The reason why the PNe

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

present so different morphological types is not well understood yet. A well accepted suggestion is that the binary central stars could be partially responsible for the bipolar shapes. Considering that there is only one 3D modeling of a bipolar PN (NGC 6302; Wright et al. 2011, MNRAS, 418, 370) and also because NGC 2346 has a binary system as central star, this PN seems to be an excellent candidate for a 3D detailed modeling. The code used for the modeling process was MOCASSIN (Ercolano, B. et al. 2003, MNRAS, 340, 1136). The density distribution we assumed for NGC 2346 has two components: torus and lobes. We considered the density constant in the torus (n_T) and three different cases in the lobes (n_L): (i) n_L = constant; (ii) $n_L \propto r^{-1}$; and (iii) $n_L \propto r^{-2}$. In our models we have observed that density stratification is essential in order to reproduce the higher ionization stages observed in this nebula. So far, the $n_L \propto r^{-1}$ distribution has given the best agreement between the observed and modeled spectrum.

[1] Observatório do Valongo - Universidade Federal do Rio de Janeiro, Ladeira Pedro Antônio, 43, 20080-090, Rio de Janeiro, Brazil (carol07@astro.ufrj.br).

G 126.1–0.8–14: A MOLECULAR SHELL RELATED TO SH2-187

S. Cichowolski[1], S. Pineault[2], R. Gamen[3,4], M. E. Ortega[1], E. M. Arnal[4,5], and L. A. Suad[5]

We present a multi-wavelength study of a region where a well defined molecular shell, named G 126.1–0.8–14, is observed. The distance of G 126.1–0.8–14 is about 1 kpc. Based on HI and CO data we analyze the atomic and molecular gas related to the structure and estimate its main physical properties. From the radio continuum and infrared data we analyze whether the emission associated with G 126.1–0.8–14 has a thermal origin. To disentangle the possible origin of the shell, and given the lack of catalogued O-type stars in the area, we observed with GEMINI the spectra of four OB stars located in projection inside the shell, to get their accurate spectral types and distances. The young HII region Sh2-187 is located onto the densest part of this molecular shell. A search for young stellar object candidates (cYSOs) was made using infrared point source catalogs. Several cYSOs are found spread out onto the shell. Based on all the available data, we discuss the possible origin of G 126.1–0.8–14 as well as its role in the formation of a new generation of stars.

[1] Instituto de Astronomía y Física del Espacio, Argentina.
[2] Département de physique, de génie physique et d'optique, Université Laval, Canada.
[3] Instituto de Astrofísica de La Plata, Argentina.
[4] Facultad de Ciencias Astronómicas y Geofísicas, Argentina.
[5] Instituto Argentino de Radioastronomía, Argentina.

THE BUBBLE N10

D. Gama[1], J. Lepine[1], Y. Wu[2], and J. Yuan[2]

We studied the environment surrounding the infrared bubble N10 in molecular and infrared emission. There is an HII region at the center of this bubble. We investigated J=1-0 transitions of molecules ^{12}CO, ^{13}CO and $C^{18}O$ towards N10. This object was detected by GLIMPSE, a survey carried out between 3.6 and 8.0 μm. We also analyzed the emission at 24 μm, corresponding to the emission of hot dust, with a contribution of small grains heated by nearby O stars. Besides, the contribution at 8 μm is dominated by PAHs (polycyclic aromatic hydrocarbons) excited by radiation from the PDRs of bubbles. In the case of N10, it is proposed that the excess at 4.5 μm IRAC band indicate an outflow, a signature of early stages of massive star formation. This object was the target of observations at the PMO 13.7 m radio telescope. The bubble N10 presents clumps, from which we can derive physical features through the observed parameters. We also intended to discuss the evolutionary stage of the clumps and their distribution. It can lead us to understand the triggered star formation scenario in this region.

[1] Departamento de Astronomia do IAG/USP, São Paulo, Brasil.
[2] Department of Astronomy, Peking University, Beijing, China.

KINEMATIC PROFILES OF NGC 3918 AND NGC 6302 FORM HIGH DISPERSION SPECTRA

P. J. A. Lago[1] and R. D. D. Costa[1]

Planetary nebulae have typical expansion velocities between 20 and 40 km/s. Using high dispersion, long slit spectroscopy obtained with the 1.60m telescope and the Coudé spectrograph at Pico dos Dias Observatory (MCT/LNA) in Brazil, we derived the kinematic profiles from forbidden lines for different

angular positions along the slit for a sample of southern PNe. Results allowed us to derive velocity profiles for the nebulae, and, for some of them, parameters such as distance and kinematic age. For NGC6302 we estimate a distance of 805 ± 143pc, in good agreement with other results from the literature. For NGC3918, the velocity profiles were used to estimate its kinematic age, assuming expansion with uniform velocity; the result was 3111 years for the external shell. Hereafter we intend to use the kinematic profiles to model these planetary nebulae with the SHAPE code, and apply this technique for a large number of southern planetary nebulae.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão, 1226 - Cidade Universitária São Paulo-SP - Brasil - CEP 05508-090.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

3MDB: THE MEXICAN MILLION MODELS DATABASE

C. Morisset[1] and G. Delgado-Inglada[1]

The 3MdB is an original effort to construct a large multipurpose database of photoionization models. This is a more modern version of a previous attempt based on Cloudy3D and IDL tools. It is accessed by MySQL requests. The models are obtained using the well known and widely used Cloudy photoionization code (Ferland et al, 2013). The database is aimed to host grids of models with different references to identify each project and to facilitate the extraction of the desired data. We present here a description of the way the database is managed and some of the projects that use 3MdB. Anybody can ask for a grid to be run and stored in 3MdB, to increase the visibility of the grid and the potential side applications of it.

[1] Instituto de Astronomia, Universidad Nacional Autonoma de Mexico. (Chris.Morisset@gmail.com).

STRUCTURE OF BUBBLES IN THE SOUTH-EAST REGION OF THE LARGE MAGELLANIC CLOUD

M. A. Oddone[1], P. Ambrocio-Cruz[2], E. LeCoarer[3], and G. V. Goldes[4]

In this work we report the kinematical results of the structure located in the South-East region of the Large Magellanic Cloud, the Supershell LMC 9. The observations have been carried out in the frame of a Hα survey of the Magellanic Clouds and the Milky Way, carried out at ESO with a 36cm diameter telescope, equipped with a focal reducer, a scanning Fabry-Perot interferometer and a photon counting camera. The Supershell LMC 9 is composed of four giant shells DEM L 164 and DEM L 165, DEM L 208, DEM L 221, and several HII regions being the most notorious DEM L 202, DEM L206 and DEM L 207. By means of energy balance we determine the characteristics parameters of these structures (superficial brightness, electronic density, emission measure, mass, luminosity, ambient density, age), that would allow us to distinguish which is the origin (stellar wind, supernova explosion or other mechanism) of the different bubbles that compose the Supershell LMC 9. In this way we try to discern if the studied objects have kinematically some identity as an ensemble, or if they are relatively isolated objects over the diffuse general background to which they belong.

[1] Observatorio Astronómico de la Universidad Nacional de Córdoba, Laprida 854, X500BGR, Córdoba, Argentina (mao @oac.uncor.edu).
[2] Instituto de Ciencias Básicas e Ingeniería, Universidad Autónoma del Estado de Hidalgo, México.
[3] Laboratoire d'Astrophysique, Universit'e Joseph Fourier, Grenoble, Francia.
[4] Facultad de Matemática, Astronomía y Física, Córdoba, Argentina.

SPECTROSCOPIC STUDIES OF TWO SUPERNOVA REMNANTS IN THE LARGE MAGELLANIC CLOUD

D. Pauletti[1] and M. V. F. Copetti[1]

This work presents a study of two supernova remnants belonging to the Large Magellanic Cloud, N49 and N11L, based on the spectroscopic mapping of their physical properties. Long slit spectroscopy was used to collect data from a grid of different positions covering the whole nebula by positioning the slit on different and equally spaced declinations. The data were obtained with the 4.1 m SOAR telescope (Southern Astrophysical Research Telescope), in Chile. The spectral coverage was about 3500-8000 Å. For each object, about 50 emission lines were measured on the spectra, allowing

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

to build maps of many interesting line intensity ratios. The maps of electron density and temperature were obtained using the [S II] λ6717/λ6731 and [O III] (λ5007+λ4959)/λ4363 line ratio sensors, respectively. N49 presents a strong density gradient with the density varying from 600 cm^{-3} at the North-West to more than 3000 cm^{-3} at the South-East. The electron temperature distribution shows a rough spherical symmetry with the higher values found at the centre. In N11L the electron density varies from less than 100 cm^{-3} to about 400 cm^{-3}, with the higher values found on the bright filaments. These maps were used to build a picture of the structure of these two supernova remnants.

[1] Laboratório de Análise Numérica e Astrofísica, Departamento de Matemática, e Programa de Pós-Gradução em Física, Universidade Federal de Santa Maria, 97119-900 Santa Maria, RS, Brazil ([paulettid;mvfc]@gmail.com).

DENSITIES, TEMPERATURES, PRESSURES, AND ABUNDANCES DERIVED FROM O II RECOMBINATION LINES IN H II REGIONS AND THEIR IMPLICATIONS

M. Peimbert[1] and A. Peimbert[1]

Based on high-quality observations of multiplet V1 of O II and the NLTE atomic computations of O II, we study the density and temperature of a sample of H II regions. We find that the signature for oxygen-rich clumps of high density and low temperature is absent in all objects of our sample: one extragalactic and eight Galactic H II regions. The temperatures derived from (1) recombination lines (RLs) of O II, and (2) RLs of H I together with Balmer continua are lower than those derived from forbidden lines, while the densities derived from RLs of O II are similar or smaller than densities derived from forbidden lines. Electron pressures derived from collisionally excited lines are about two times larger than those derived from RLs. These results imply that the proper abundances are those derived from RLs and suggest that other processes in addition to direct photoionization, such as dissipation of turbulent energy in shocks, magnetic reconnection, and shadowed regions, might be responsible for the large abundance discrepancy factor and t^2 values observed in H II regions.

[1] Instituto de Astronomía, Universidad Nacional Autónoma de México, Apartado Postal 70–264, México, D.F. 04510, México, (peimbert@astro.unam.mx).

SPATIAL VARIATIONS OF PHYSICAL AND CHEMICAL PROPERTIES OF THE PLANETARY NEBULAE NGC 6302 AND NGC 2440

A. B. Rauber[1], M. V. F. Copetti[1], and A. C. Krabbe[2]

We present an analysis of the physical and chemical conditions of the planetary nebulae NGC 6302 and NGC 2440 through spatially resolved spectroscopy. Long slit spectrophotometric data were obtained with the Goodman spectrograph attached to the 4.1 m SOAR telescope in several different declinations with the slit on the East-West direction. From them, maps and spatial profiles were constructed. Electron densities were calculated from the [S II] and [Ar IV] sensors, and electron temperatures from the [N II] and [O III] sensors. Small temperature fluctuations on the plane of the sky were obtained. Abundances of N^+, O^+, S^+, S^2+, O^{2+}, Ne^{2+}, Ar^{3+}, Ar^{4+} relative to H^+ were determined from collisionally excited lines, and relative abundances of He^+ and He^{2+} from recombination lines.

[1] Laboratório de Análise Numérica e Astrofísica, Departamento de Física, e Departamento de Matemática, Universidade Federal de Santa Maria, 97119-900, Santa Maria, RS, Brazil ([alinerauber;mvfc]@gmail.com).
[2] Universidade do Vale do Paraíba, Av. Shishima Hifumi, 2911, 12244-000, São José dos Campos, SP, Brazil (angela.krabbe@gmail.com).

THE MAGNETIC FIELD STRUCTURE OF MUSCA DARK CLOUD

N. L. Ribeiro[1], A. M. Magalhães[1], A. Pereyra[2], and L. Cambresy[3]

Our goal is the study of the magnetic field (MF) structure of a pre-collapse structure of the interstellar medium - the Musca Dark Cloud (MDC), a nearby (200-250 pc), large (0.25° x 3°) filamentary cloud. A description of the MF, together with knowledge on turbulence and gravitational forces, is key to understanding the evolution of interstellar clouds.

We have obtained linear polarization measurements in the H band (1.65μm) with the Brazilian's 60 cm and 160 cm telescopes located at the OPD observatory. By combining these with our earlier optical observations (Pereyra & Magalhaes 2004), we were able to probe regions denser than what was possible in the optical.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

Our studies in the optical band showed that the cloud is surrounded by a MF which is well aligned with the projected small axis of the cloud. Our H-band data show in general the same tendency in the inner parts of the MDC. The comparison between the V and H bands allow us to conclude that the same type of grains are polarizing the light throughout the cloud at least up to Av $\sim$ 8-9, and that these are the same as those in the general ISM. Utilizing the dispersion of the polarization vectors, we estimated the MF intensity (0.02-0.16 mG) across the cloud. We compared the magnetic and gravitational energies and concluded that Musca is a subcritical cloud. From the structure function of the polarization at the H band, we obtain 0.21-0.29 pc for the range of correlation lengths of the MF in the cloud, comparable to the size of the optical condensations.

[1] IAG/USP - Brazil.
[2] INPE - Brazil.
[3] Observatoire de Strasbourg - France.

THE EXTINCTION ON THE SOUTHERN GALACTIC DISK AS SEEN FROM THE VVV SURVEY: A RAYLEIGH-JEANS EXTINCTION MAP

M. Soto[1,2], R. Barbá[2], V. Firpo[2,3], and A. Roman-Lopes[2]

We report on the development of an extinction map for the Southern Galactic disk based on the combination of Near-Infrared (NIR) observations of the ESO public survey VISTA Variables in the Milky Way (VVV), complemented with GLIMPSE and 2MASS data. The 520 deg^2 observed by VVV in 5 near infrared bands (J, H, K_s, Y, Z), and multiple epochs, are a wealth of information which are important to address fundamental questions about the structure and formation history of the Milky Way. The region surveyed by this work, the 152 VVV tiles/fields of the Southern Galactic disk, overlaps with the 2MASS and GLIMPSE surveys, and thus allows the sources surveyed to have multiband photometry ranging from the near to mid-infrared wavelengths. Our results, using the Rayleigh-Jeans Color Excess method (RJCE), have allowed us to obtain an extinction map with a pixel size of 1'$\times$1', which is consistent with other maps developed recently. Furthermore, our results show a systematic underestimation of extinction by previous work based on 2MASS NIR data alone.

[1] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA (msoto@stsci.edu).
[2] Departamento de Física, Universidad de La Serena, Av. Cisternas 1200 Norte, La Serena, Chile.
[3] IALP-CONICET, La Plata, Argentina.

THE DISCREPANT KINEMATICS OF RECOMBINATION AND COLLISIONALLY EXCITED LINES IN NGC 7009 AS A FUNCTION OF IONIZATION STRUCTURE

S. Torres-Peimbert[1], M. G. Richer[2], L. Georgiev[1], and A. Arrieta[3]

We have analyzed the kinematics of emission of the planetary nebula NGC 7009 from long slit spectroscopy from the UVES spectrograph at the VLT of ESO. In particular we are interested in comparing lines excited by recombination and collisions with electrons to determine whether similarities or differences could be useful in elucidating the well-known abundance discrepancy derived from them.We construct position–velocity maps for recombination, fluorescence, charge transfer, and collisionally excited lines.We find a plasma component emitting in the C II, N II, O II, and Ne II recombination lines whose kinematics are discrepant: they are incompatible with the ionization structure derived from all other evidence and the kinematics derived from all of these lines are unexpectedly very similar. We found direct evidence for a recombination contribution to [N II] λ5755. Once taken into account, the electron temperatures from [N II], [O III], and [Ne III] agree at a given position and velocity. The electron densities derived from [O II] and [Ar IV] are consistent with direct imaging and the distribution of hydrogen emission. The kinematics of the C II, N II, O II, and Ne II lines does not coincide with the kinematics of the [O III] and [Ne III] forbidden emission, indicating that there is an additional plasma component to the recombination emission that arises from a different volume from that giving rise to the forbidden emission from the parent ions within NGC 7009. Thus, the chemical abundances derived from either type of line are correct only for the plasma component from which they arise. Apart from [N II] λ5755, we find no anomaly with the forbidden lines usually used to determine chemical abundances in ionized nebulae, so the abundances derived from them should be reliable for the medium from which they arise.

[1] Instituto de Astronomía, Universidad Nacional Autónoma de México, Apartado Postal 70–264, México, D.F. 04510, México, (silvia@astro.unam.mx).
[2] Instituto de Astronomía, Universidad Nacional Autónoma de México, Apartado Postal 877, Ensenada, B. C., 22800, México (richer@astrosen.unam.mx).
[3] Departamento de Física y Matemáticas, Universidad Iberoamericana, Prolongación Paseo de la Reforma 880, Lomas de Santa Fe, México, 01219, D. F. , México, (anabel.arrieta@ibero.mx).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

STAR FORMATION

3D SIMULATIONS OF THE BEEHIVE PROPLYD

J. A. Feitosa[1], M. J. Vasconcelos[1], and A. H. Cerqueira[1]

Some star formation regions, like the Orion nebula, have stars of different masses, from massive stars, responsible for strong ionizing winds and HII regions, to low-mass stars, which spend a long time in the protostellar phase, and are frequently associated with protostellar disks and jets. Massive O or B stars emit a great deal of UV radiation, able to dissociate the hydrogen molecule (FUV radiation, energies between 6-13 eV), to ionize the atomic hydrogen (EUV radiation, energies greater than 13.6 eV) and heat the gas. Around these stars, a large and hot ($10^4 K$) region is formed, known as HII region. T-Tauri stars inside HII regions produce a type of young stellar object, a proplyd, described with accuracy in O'Dell et al. (1993). Proplyds exhibit a cometary shape from which we can distinguish a central low-mass star with an accretion disk, an ionization front, a photodissociation region and, sometimes, an external bow shock and a protostellar jet. Its morphological characteristics depends on the distance between the low-mass star and the source of the ionizing radiation. The Beehive, a giant proplyd in Orion Nebula, has attracted attention due to its exotic system of rings coaxial to the HH540 jet's axis. Bally et al. (2005) suggested that the rings are perturbations due to the crossing of the ionization front by the jet. In this work, we test this hypothesis making 3D hydrodynamic numerical simulations over an adaptive grid, using the Yguazú-A code (Raga et al., 2000), properly adapted for the Beehive conditions. Our results show that the jet causes a perturbation in the ionization front of the proplyd, but is necessary to adjust carefully some parameters of the jet like its velocity and ejection frequency in order to have the results matching the observations.

[1] Laboratório de Astrofísica Téorica e Observacional, Universidade Estadual de Santa Cruz, 45662-900, Rodovia Jorge Amado km 16, Ilhéus, Brasil (jamfeitosa@gmail.com; mjvasc @uesc.com; hoth@uesc.com).

THE NATURE OF X-RAY SOURCES ASSOCIATED TO YOUNG CLUSTERS AROUND SH2-296

J. Gregorio-Hetem[1], B. Fernandes[1,2], and T. Montmerle[2]

Aiming to unravel the star formation activity in the Canis Major R1 (CMaR1), we have studied the young (< 5 Myr) clusters associated to the arc-shaped ionized nebula Sh2-296. Based on our X-ray data complemented by optical and near-IR data, we discovered, near to GU CMa, a stellar cluster that is older by at least a few Myr than the previously known cluster, around Z CMa, where star formation is still very active. Multi-object optical spectroscopy of our X-ray sources nearby Z CMa was performed with *Gemini* telescopes to confirm the existence of a mixed population from both older and younger clusters around the edge of Sh2-296. In the present work we show the results for optical counterparts candidates of 45 X-ray sources. Spectral type determination was based on comparison with standard spectra library and fitting the continuum and TiO bands. Typical features of young stars were inspected to confirm the nature of the sample that is mainly classified as T Tauri stars (TTs), since their spectra show the Li I line, one of the indicators of youth. The equivalent width of $H\alpha$ measured at 10% of the total flux was used to separate Classical TTs (CTTs) from weak-line TTs (WTTs). Among 51 optical counterparts candidates, 38 are young stars: 24% of them are classified as CTTs and 76% are WTTs. However the present results correspond to a small fraction (∼15%) of the entire sample of X-ray sources we have detected. Aiming a more representative set of spectra, additional GMOS observations have been performed, as well as another ongoing project (see Santos-Silva et al.) dedicated to studying of the X-ray properties.

[1] Universidade de São Paulo, IAG, Brazil (jane.gregorio.hetem @iag.usp.br).
[2] Institut d'Astrophysique de Paris, France.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

ON THE ASSOCIATION OF YOUNG STAR CLUSTERS AND THEIR PARENTAL CLOUDS: A STATISTICAL FRACTAL ANALYSIS

A. Hetem[1], J. Gregorio-Hetem[2], B. Fernandes[2], and T. Santos-Silva[2]

We present a study of 21 young star clusters aiming to characterize their association to dense clouds. The structure of the clouds was evaluated by means of the Q statistical fractal analysis, designed to compare their geometric structure with the spatial distribution of the cluster members. The sample was selected from the study by Santos-Silva and Gregorio-Hetem (2012, A&A, 547, A107) that evaluated the radial density profile of the stellar superficial distribution of the young clusters. The fractal dimension and other statistical parameters of most of the sample indicate that there is a good cloud-cluster correlation, when compared to other works based on an artificial distribution of points (Lomax et al. 2011, MNRAS, 412, 627). As presented in a previous work (Fernandes et al. 2012, A&A, 541, A95), the cluster NGC 6530 is the only object of our sample that presents anomalous statistical behaviour. The fractal analysis shows that this cluster has a centrally concentrated distribution of stars that differs from the substructures found in the density distribution of the cloud projected in the A_V map, suggesting that the original cloud geometry was changed by the cluster formation.

[1] Universidade Federal do ABC, CECS, Brazil (annibal.hetem@ufabc.edu.br).
[2] Universidade de São Paulo, IAG, Brazil.

INCREASE OF IONIZATION FRACTION OF DUSTY PROTO-STELLAR ACCRETION DISKS BY DAMPING OF ALFVÉN WAVES

V. Jatenco-Pereira[1]

The ambient of the cloud that gives rise to the process of star formationconsisted of: turbulence, magnetic field and dust. In general, in the process of star formation there is the formation of an accretion disk whose material must lose their angular momentum in order to be accreted into the central object. The magneto-rotational instability (MRI) is probably the mechanism responsible for a magneto-hydrodynamic (MHD) turbulence that leads to disk accretion. However, this mechanism only exists if the gas in the disk is sufficiently ionized to be coupled to the magnetic field. Besides the viscous heating mechanism often included in the models by means of the alpha-prescription, in this work we study the damping of Alfvén waves as an additional heating source. The waves suffer a damping near the dust-cyclotron frequency, since charged grains in a magnetized disk are highly coupled to the waves due to cyclotron resonances. We study the transfer of energy from the damping of the waves to the disk and we show that this mechanism can increase the ionization fraction, making possible the presence of the MRI in a large part of the disk.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão, 1226 - 05508-090 Cidade Universitária, São Paulo, SP, Brazil (vera.jatenco@iag.usp.br).

THE ROLE OF RECONNECTION DIFFUSION IN THE GRAVITATIONAL COLLAPSE OF TURBULENT CLOUD CORES

M. R. M. Leão[1], E. M. de Gouveia Dal Pino[2], R. Santos-Lima[2], and A. Lazarian[3]

For a molecular cloud clump to form stars some transport of magnetic flux is required from the denser, inner regions to the outer regions of the cloud, otherwise this can prevent the collapse. Fast magnetic reconnection which takes place in the presence of turbulence can induce a process of reconnection diffusion (RD). Extending earlier numerical studies of reconnection diffusion in cylindrical clouds, we consider more realistic clouds with spherical gravitational potentials and also account for the effects of the gas self-gravity. We demonstrate that within our setup RD is efficient. We have also identified the conditions under which RD becomes strong enough to make an initially subcritical cloud clump supercritical and induce its collapse. Our results indicate that the formation of a supercritical core is regulated by a complex interplay between gravity, self-gravity, the magnetic field strength and nearly transonic and trans-Alfvénic turbulence, confirming that RD is able to remove magnetic flux from collapsing clumps, but only a few of them become nearly critical or supercritical, sub-Alfvénic cores, which is consistent with the observations. Besides, we have found that the supercritical cores built up in our simulations develop a predominantly helical magnetic field geometry which is also consistent with observations. Finally, we have evaluated the effective values of the turbulent reconnection diffusion coefficient

and found that they are much larger than the numerical diffusion, especially for initially trans-Alfvénic clouds, ensuring that the detected magnetic flux removal is due to to the action of the RD rather than to numerical diffusivity.

[1] Instituto de Matemática, Estatística e Computação Científica, UNICAMP.
[2] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP.
[3] University of Wisconsin.

MODELING THE CIRCUMSTELLAR ENVIRONMENT OF AB AUR USING THE Hα LINE

G. H. R. A. Lima[1], K. Perraut[2], C. Dougados[2,3], and M. Benisty[2]

AB Aurigae is the brightest Ae Herbig star in the northern hemisphere and it shows evidence of accretion and ejection processes in its circumstellar region. Moreover the Hα line shows a P-Cygni type profile which is a common indication of wind. Its Hα line is very variable, and most of this variation occurs in its blue-shifted side. One of the processes that can be used to explain this variation is a disk wind similar to those of the classical T Tauri stars. AB Aurigae has been observed using spectral interferometry in the optical region, by the VEGA spectrometer in the CHARA-array, which can resolve details of milliseconds of arc in size: in the case of AB Aur represent sizes smaller than 1 AU. With this resolution, it's possible to observe the region where the wind is being ejected. Using a radiative transfer code that already had been used to model the Hα line profiles in classical T Tauri stars, and adapting it to model the Hα line in AB Aur, we calculate an intensity map showing the region where this line is being formed, and then we compare it with data from the interferometric observations. This work will give us a better understanding of the ejection and accretion mechanism that are responsible for the formation of the Hα line around AB Aur and in some of the Herbig Ae/Be stars, and whether a disk wind mechanism can explain or not this line in these objects.

[1] Departamento de Física, Universidade Federal de Minas Gerais, Avenida Antônio Carlos, 6627 - 31970-201 Belo Horizonte, MG - Brazil (styx@fisica.ufmg.br).
[2] Institut de Planétologie et d'Astrophysique de Grenoble, Grenoble - France.
[3] UMI FCA CNRS - Departamento de Astronomia, Universidad de Chile, Santiago - Chile.

STEADY-STATE ACCRETION DISK MODELS WITH VARIABLE α

E. R. S. O. Magalhães[1], A. H. Cerqueira[1], and M. J. Vasconcelos[1]

We present solutions for the radial and vertical structure of standard accretion disks (Shakura & Sunyaev). In these disks, the accretion and distribution of the angular momentum are controlled by the viscosity parameter, α. Self-similarity solutions for accretion disks predict that α must be constant on the disk, if the viscosity can be described by a power law $\nu \propto R^{\gamma}$ with $\gamma = 1$. Recently, Isella et al. (2009) showed that for a sample of 14 young stellar objects, $-0.8 \leq \gamma \leq 0.8$, indicating that $\alpha = \alpha(R)$. Based on these evidences, we have computed the structure for 11 of these objects, using $\alpha(R)$ as prescribed by Isella et al. (2009). We compare our results with the solutions of the same disks for $\alpha = 10^{-3}$ to 10^{-1}, constant. Our results show that the disks (as expected) are lighter, cooler and thinner in its inner regions, when compared with the disks with α constant. We make a qualitative analysis of the solutions obtained with the JED + SAD models (Jet Emitting Disk + Standard Accretion Disk), which also predict the same behavior for the central part of the accretion disks. We show that the height scale maps the age of the objects: the disks become thinner overall to the extent as the objects become older. As the stars studied have different masses and accretion rates, the results appear to be independent of the specific characteristics of the disk+star system.

[1] Programa de Pós-graduação em Física, Universidade Estadual de Santa Cruz, Campus Soane Nazaré de Andrade, Rodovia Jorge Amado, Km 16, Bairro Salobrinho, CEP 45662-900, Ilhéus-Bahia-Brasil (pockerrohan@gmail.com; hoth@uesc.br; mjvasc@uesc.br).

THE SONYC SURVEY: TOWARDS A COMPLETE CENSUS OF BROWN DWARFS IN STAR FORMING REGIONS

K. Muzic[1], A. Scholz[2], R. Jayawardhana[3], V. C. Geers[4], P. Dawson[4], T. P. Ray[4], and M. Tamura[5]

Deep surveys of star forming regions are the backbone of observational studies on the origin of stars and planets: On one side, they provide large and homogeneous object samples required to study disks,

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

accretion, and multiplicity. On the other side, such surveys determine the shape and the low-mass limit of the Initial Mass Function (IMF), which are fundamental constraints on star formation theory.

SONYC, short for "Substellar Objects in Nearby Young Clusters", is an ongoing project to provide a census of the substellar population in nearby star forming regions. We have conducted deep optical and near-infrared photometry, combined with proper motions, and followed by extensive spectroscopic follow-up campaigns with Subaru and VLT, in which we have obtained more than 700 spectra of candidate objects in NGC1333, ρ Ophiuchi, Chamaeleon-I, Upper Sco, and Lupus-3. We have identified and characterized more than 60 new substellar objects, among them a handful of objects with masses close to, or below the Deuterium burning limit. Thanks to the SONYC survey and the efforts of other groups, the substellar IMF is now well characterized down to $\sim 5-10 M_J$, and we find that the ratio of the number of stars with respect to brown dwarfs lies between 2 ad 6. Another important piece of information for the star formation theories is that, down to $\sim 5 M_J$, the free-floating objects with planetary masses are 20–50 times less numerous than stars, so that their total contribution to the mass budget of the clusters can be neglected.

In this contribution we will present the status of the SONYC survey, discuss its main results, and focus on the latest findings in NGC1333, Lupus-3 and Upper-Sco.

[1] European Southern Observatory (ESO), Chile.
[2] School of Physics & Astronomy, St. Andrews University, United Kingdom.
[3] Department of Astronomy & Astrophysics, University of Toronto, Canada.
[4] School of Cosmic Physics, Dublin Institute for Advanced Studies, Ireland.
[5] National Astronomical Observatory of Japan, Tokyo, Japan.

A SURVEY OF EXTENDED H_2 EMISSION TOWARDS A SAMPLE OF MASSIVE YSOS

F. Navarete[1], A. Damineli[1], C. L. Barbosa[2], and R. D. Blum[3]

Very few massive stars in early formation stages were clearly identified in the Milky Way and moreover, the processes of formation of such objects lacks of observational evidences. Two theories predict the formation of massive star: *i*) by merging of low mass stars or *ii*) by an accretion disk. One of the most prominent evidences for the accretion scenario is the presence of bipolar outflows associated to the central sources. Those structures were found on both intermediate and low-mass YSOs, but there are no evidences for associations with MYSOs. Based on that, a survey was designed to investigate the earliest stages of massive star formation through the molecular hydrogen transition at 2.12 μm. A sample of $\sim$ 300 MYSOs candidates was selected from the Red MSX Source program and the sources were observed with the IR cameras Spartan (SOAR, Chile) and WIRCam (CFHT, Hawaii). Extended H_2 emission was found toward 55% of the sample and 30% of the positive detections (50 sources) have bipolar morphology, suggesting collimated outflows. These results support the accretion scenario, since the merging of low mass stars would not produce jet-like structures.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão, 1226, Office E-302, 05580-090 São Paulo/SP, Brazil (navarete@usp.br).
[2] UNIVAP, São José dos Campos/SP, Brazil.
[3] NOAO, Tucson, Arizona, USA.

STUDY OF TRIGGERED STAR FORMATION IN A BRIGHT-RIMMED CLOUD

M. E. Ortega[1], S. Paron[1], E. Giacani[1], and A. Petriella[1]

Bright-rimmed clouds (BRCs) are small and dense molecular clouds located in the periphery of the evolved HII regions. The illumination of these dark clumps by nearby OB stars might be responsible for triggered collapse and subsequent star formation through the mechanism known as radiation-driven implosion (RDI). We carried out a multi-wavelength study of a BRC located in the periphery of the evolved HII region G52.85-0.55. From the evaluation of the pressure balance between the ionized gas located at the illuminated border of the clump and the molecular gas, we show that shocks are being driven in the external layers of the BRC. On the other hand the pressure balance suggests that the birth of young stellar objects embedded in the BRC could have been initiated by the RDI mechanism.

[1] Instituto de Astronomía y Física del Espacio (CONICET-UBA) Ciudad Universitaria, Pabellón IAFE, Ciudad Autónoma de Buenos Aires, Argentina (mortega@iafe.uba.ar).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

INFRARED STUDY OF NEW STAR CLUSTER CANDIDATES ASSOCIATED TO DUSTY GLOBULES

P. Soto King[1], R. Barbá[1], A. Roman-Lopes[1], M. Jaque[1,2], V. Firpo[1,3], J. L. Nilo[1], M. Soto[1,4], and D. Minniti[5]

We present results from a study of a sample of small star clusters associated to dusty globules and bright-rimmed clouds that have been observed under ESO/Chile public infrared survey *Vista Variables in the Vía Láctea (VVV)*. In this short communication, we analyse the near-infrared properties of a set of four small clusters candidates associated to dark clouds. This sample of clusters associated to dusty globules are selected from the new VVV stellar cluster candidates developed by members of La Serena VVV Group (Barbá et al. 2014). Firstly, we are producing color-color and color-magnitude diagrams for both, cluster candidates and surrounding areas for comparison through PSF photometry. The cluster positions are determined from the morphology on the images and also from the comparison of the observed luminosity function for the cluster candidates and the surrounding star fields. Now, we are working in the procedures to establish the full sample of clusters to be analyzed and methods for subtraction of the star field contamination. These clusters associated to dusty globules are simple laboratories to study the star formation relatively free of the influence of large star-forming regions and populous clusters, and they will be compared with those clusters associated to bright-rimmed globules, which are influenced by the energetic action of nearby O and B massive stars.

[1] Departamento de Física, Universidad de La Serena, Av. Cisternas 1200, La Serena, Chile (piera@dfuls.cl).
[2] ICATE-CONICET (Argentina).
[3] IALP-CONICET (Argentina).
[4] Space Telescope Science Institute (USA).
[5] P. Universidad Católica (Chile).

THE INNER DISKS OF CLASSICAL T TAURI STARS IN NGC 2264

A. P. Sousa[1], P. T. McGinnis[1], S. H. P. Alencar[1], J. Bouvier[2], P. Teixeira[3], and J. Stauffer[4]

NGC 2264 is a young ($\sim$ 3 Myr) stellar cluster that was observed twice by the CoRoT satellite, the first time for 23 days in 2008 and the second during 40 days in 2011. Simultaneous with the 2011 CoRoT observations, a multi-wavelength campaign was organized that included 30 days of Spitzer observations at 3.6 and 4.5 microns, 3.5 days of Chandra data, VLT FLAMES spectroscopy and U band photometry from Megacam (CFHT). We obtained simultaneous high precision light curves in the optical and near IR for more than 500 cluster members, about 200 of which are classical T Tauri stars. As shown in the first CoRoT campaign, a fraction of the accreting systems exhibit optical light curves with deep minima that vary substantially in width and depth in a rotational timescale. These light curves are interpreted as due to an inner disk warp that eclipses the star as the system rotates, like observed in AA Tau, a well studied CTTS seen at high inclination. This warp is thought to be created by the star-disk interaction mediated by a stellar magnetic field inclined with respect to the stellar rotation axis. The observed variability indicates the star-disk interaction is dynamic and the occulting material is inhomogeneous and located close to the co-rotation radius of the star-disk system. We present the photometric and spectroscopic analysis of the AA Tau-like CTTSs observed in NGC 2264. Initial light curve model results indicate that an inner disk warp located near the co-rotation radius can indeed explain the observed variability and that, if the variability is attributed to extinction alone, the properties of the dust in the inner disk are substantially different from the ISM.

[1] Universidade de Federal de Minas Gerais Av. Antônio Carlos, 6627 - 31270-901 Belo Horizonte, MG - Brasil (alana @fisica.ufmg.br).
[2] Institut de Planétologie et d'Astrophysique de Grenoble - IPAG.
[3] Institut für Astrophysik Universität Wien.
[4] Spitzer Science Center - Caltech.

MILLIMETER AND FAR-IR OBSERVATIONS OF THE IRDC G341.24-0.27

J. Vasquez[1,2], C. Cappa[1,2], G. Romero[2], and M. Rubio[3]

Infrared Dark Clouds (IRDCs) are the cold T $<$ 25 K) and dense ($> 10^5$ cm^{-3}) regions, with a scale of 1 – 10 pc and a mass of $10\times^{2-5}$M$_\odot$. Cores within the IRDCs may be in different phases, from a quiescent to an active one. Quiescent cores represent the earliest protostellar (starless) core phase without infrared signatures of star formation, commonly observed at

far IR wavelengths, while active cores have extended and enhanced 4.5μm emission.

In this work, we analyze CO(2-1), 13CO(2-1), and CO(2-1) lines, and mid- and far-infrared data towards the EGOS (Extended Green Objects) G341.23-0.27 and G341.22-0.26(a), projected onto the IRDC G341.24-0.27.

[1] Instituto Argentino de Radioastronomía, CONICET, Argentina.
[2] Facultad de Ciencias Astronómicas y Geofísicas de La Plata, Argentina.
[3] Departamento de Astronoímia, Universidad de Chile.

FINDING PROTO-SPECTROSCOPIC BINARIES: PRECISE MULTI-EPOCH RADIAL VELOCITIES OF 7 PROTOSTARS IN ρ OPHIUCHUS

P. Viana Almeida[1,2,3], C. Melo[2], N. C. Santos[1], P. Figueira[1], M. Sterzik[2], and J. F. Gameiro[1]

Stars in the solar neighborhood are mostly found in multiple systems. While the existence of stellar companions at visual distances can be easily explained as a normal outcome of the star formation process itself, it is still unclear how spectroscopic companions are actually formed. If they are a by-product of the initial fragmentation of molecular clouds, or resultant from dynamical evolution within pristine multiple systems is still an open question in star formation. To uncover a young spectroscopic binary would be therefore an invaluable clue for understanding the mechanisms and the time scales involved in their formation. Aiming at finding such young spectroscopic companions, we present a near-IR high resolution (R $\sim$ 60000) multi-epoch radial velocity survey of 7 young stellar objects in the star forming region ρ Ophiuchus. The radial velocities of each source were derived using a 2-D cross-correlation function designed to deliver the radial velocity of the target relative to the zero-point established by the earth's atmosphere. We found that the spectra of the protostars in our sample agree reasonably well with predicted stellar photospheric profiles indicating that the radial velocities uncovered are of stellar nature. Three of the targets analyzed give us hints that the first proto-spectroscopic binaries might have been found. If confirmed, it will bring an important piece into the (binary) star-formation puzzle, namely, that multiplicity at sub-AU scale starts (or not) at birth. Our preliminary binary fraction of $\sim$71% is also in line with the notion that multiplicity is very high at young ages and therefore it might be a product of star-formation.

[1] Centro de Astrofísica, Universidade do Porto, Rua das Estrelas, 4150-762 Porto, Portugal.
[2] ESO, Alonso de Cordova 3107, Casilla 19001, Vitacura, Santiago, Chile.
[3] Universidade Federal de Minas Gerais, Avenida Presidente Antônio Carlos, 6627 - Ventosa, Belo Horizonte - MG, 31270-901, Brasil, palmeida@fisica.ufmg.br.

STAR AND PLANET FORMATION IN THE ERA OF THE SUBMILLIMETER OBSERVATORIES SMA/ALMA

L. Zapata[1]

I present the recent advances and challenges on the star and planet formation studies in era of the submillimeter observatories: the Submillimeter Array (SMA) and the Atacama Large Millimeter/Submillimeter Array (ALMA). These observatories now provide angular resolutions similar to those obtained in the optical regimen allowing to study the obscured innermost parts of the circumstellar disks where the planet and star formation are taken place. When ALMA is finished, its sensivity and high angular resolution might reveal planets around closeby young stars just in the process of formation. This will open a new venue for the understanding on the origin of our own solar system.

[1] Centro de Radioastronomía y Astrofisica (CRyA), UNAM.

STARS & STELLAR SYSTEMS

THE BIOSUN PROJECT: AN ASTROBIOLOGICAL APPROACH TO STUDY THE ORIGIN OF LIFE

X. C. Abrevaya[1], A. Hanslmeier[2], M. Leitzinger[2], P. Odert[2], J. E. Horvath[1], I. Ribas[3], D. Galante[4], and G. F. Porto de Mello[5]

During the early ages of the Earth the magnetic activity of the young Sun was much stronger than that of the present Sun, in particular for radiation emitted below 1700 Å. Such enhanced radiation fluxes could play a role in the evolution of planetary atmospheres, their surface conditions and in the origin and evolution of life. Solar stellar analogs could provide information about the characteristics of the young Sun, and therefore this radiation environment.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

The objective of this project is to focus on the radiation emission features of the young Sun through solar stellar analogs to 1) Characterize the radiation environment of the early Earth and other planetary bodies of the Solar System that are or could have been suitable for life. 2)Reproduce this radiation environment under laboratory simulated conditions to explore: Whether cells could survive at that level of radiation on the early Earth confronting that with the microbial fossil record. Early Mars and Europa will be also tested; b) The possibility of "transfer" of microorganisms between Mars-Earth or Venus-Earth at that time. For Mars studies we consider as a model the Nakhla meteorite and halites; c) The formation, inflow and outflow of some prebiotic molecules in the early planetary conditions. Finally, the experimental approach will be carried out exposing microorganisms/molecules to this environments under laboratory simulated conditions, according to the data obtained previously.

[1] Nucleo de Pesquisa em Astrobiologia/IAG - USP, Rua do Matao 1226, Cidade Universitária, 05508-090 Sao Paulo, Brazil (abrevaya@iafe.uba.ar).
[2] Institute of Physics, Karl-Franzens-Universitat Graz, Graz, Austria.
[3] Institut de Ciencies de l'Espai/CSIC, Barcelona, Spain.
[4] CNPEM/LNLS, Campinas, Sao Paulo, Brazil.
[5] Observatorio do Valongo/UFRJ, Rio de Janeiro, Brazil.

MULTI-EPOCH INFRARED SPECTROSCOPY OF μ CENTAURI PRIOR TO OUTBURST

G. Aguayo[1], R. E. Mennickent[1], S. Otero[2], and A. Granada[3]

We present 9 L-band spectra of the Be star μ Cen obtained with the VLT ISAAC distributed along 1 year during an epoch of relative photometric quiescence prior to a $\Delta V = 0.4$ mag outburst. Visual estimates for the V magnitude obtained during the last 13 years are also presented. The L-band region from 2.9 to 4.1 microns contains important diagnostic Hydrogen lines that are sensitive to changes in the optical depth conditions of the star envelope. We chose μ Centauri as our target due to its brightness and short recurrence time of relatively well documented outbursts in order to study the evolution of the Be star envelope along time including matter ejection episodes. We measured line strengths, line widths and constructed a line flux ratio diagram as the one made by Lenorzer et al. (2002). Despite the fact that we found the star into a quiescence period, we observe significant and monotonic changes in emission line strength of Bracket-α and Pfund-γ lines relative to Humphreys series. We interpret this variability as changes in the opacity of the circumstellar envelope, moving from an optically thin to an optically thick condition just prior to a major outburst.

[1] Universidad de Concepción, Departamento de Astronomía, Casilla 160-C, Concepción, Chile. (gusaguayo@astro-udec.cl)
[2] Buenos Aires,Argentina;American Association of Variable Star Observers (AAVSO), Cambdrige, MA, USA.
[3] Geneva Observatory,University of Geneva, Switzerland.

DETERMINATION OF LI ABUNDANCE IN SOLAR TYPE STARS OF INTERMEDIATE BRIGHTNESS

E. M. Amazo-Gómez[1], B. Hernandez-Águila[2], M. C. Dagostino[2], E. Bertone[2], and V. de la Luz[2]

The determination of the lithium abundance in stellar atmospheres is of fundamental importance in multiple contexts of contemporary astrophysics. On the one hand, the lithium present in stars with global sub-solar metal abundances provides a strong restriction on the abundance of this element as a result of primordial nucleo-synthesis. On the other hand, Li can be an age indicator for stars with convective envelopes. Additionally, Li abundance appears to be correlated with the presence of sub-stellar companions. We present preliminary results of a project aimed at determining the Li abundance in an extended sample of solar-like stars (spectral type G and luminosity class V) of intermediate brightness. High resolution spectroscopic data (R=65000) were obtained with the CanHiS echelle spectrograph on the 2.11m telescope of the Guillermo Haro Observatory in Cananea, Sonora, Mexico. We report the equivalent widths of a first sub-sample of 33 stars.

[1] Observatorio Astronómico Nacional de Colombia, OAN, Universidad Nacional de Colombia, Campus Bogotá, Bogotá, Colombia (emamazog@unal.edu.co).
[2] Instituto Nacional de Astrofísica, Óptica y Electrónica, INAOE, Tonantzintla, Puebla, México.

ACCRETION DISC MAPS OF V2051 OPH ALONG OUTBURST: ADDITIONAL EVIDENCE IN FAVOR OF THE MASS-TRANSFER INSTABILITY MODEL

E. L. Andrade[1] and R. Baptista[1]

Dwarf novae (DNs) are mass-exchanging binaries showing repeated outbursts, lasting from days to weeks and recurring on timescales from weeks to years, in which their accretion discs brighten by factors 20-100 either because of a thermal-viscous instability cycle in the accretion disc (the DI model) or as a consequence of an instability in the mass-donor star leading to a burst of enhanced mass-transfer (the MTI model). While the issue seemed to be settled in favor of the DI model, the last decade has progressively provided compelling evidence in support of the idea that there is a group of DN the outbursts of which are powered by MTI. V2051 Oph is one of the DNs yielding stronger evidence in favor of the MTI (Baptista et al. 2007). Here we report eclipse mapping analysis of velocity-resolved ($|v| = 400 - 1000\,km/s$) $H\beta$, $HeI\,\lambda4922$ and nearby continuum light curves of V2051 Oph on 4 consecutive nights along its 2002 July outburst, based on spectroscopy collected with the 1.5 m ESO telescope. The outburst starts with a ring of enhanced emission at the circularization radius, which spreads inwards and outwards with velocities of $\geq -0.9\,km/s$ and $+0.2\,km/s$, respectively, to form an extended bright disc in less than a day. The outburst maximum $H\beta$ map shows two asymmetric arcs reminiscent of the spiral arms seen in other outbursting dwarf novae. Assuming a distance of 108 pc, the disc temperatures at outburst maximum barely reach the critical temperature above which the gas should be while in outburst according to DI model, and remain below that limit on all other nights. The results are at odds with predictions of the DI model, but are in good agreement with the expected response of a viscous disc to a burst of dense, enhanced mass-accretion through its sparse outer regions.

[1] Grupo de Astrofísica, Universidade Federal de Santa Catarina, Brazil (eduardo.andrade@astro.ufsc.br, raybap@gmail.com).

SPECTROSCOPY OF THE OPEN CLUSTER REMNANT CANDIDATE ESO429-SC02

M. S. Angelo[1], W. J. B. Corradi[1], J. F. C. Santos Jr.[1], and F. F. S. Maia[1]

In this study we intend to assess the physical nature of the open cluster remnant (OCR) candidate ESO429-SC02. In a previous work, the method of characterization devised by Pavani & Bica (2007) failed to characterize the object as an OCR or as an asterism, classifying it as a possible OCR. We carried out multi-object spectroscopy of 31 stars in its inner area ($r \lesssim 4'$) using GMOS/GEMINI-S (resolution $R \approx 2000$). We cross-correlated (IRAF's FXCOR task) our science spectra with all templates from ELODIE and PHOENIX libraries to obtain radial velocities and atmospheric parameters. We also employed 2MASS photometric data and proper motions from UCAC4. Individual distances via spectroscopic parallax and reddening values were derived for our science stars. In order to identify candidate member stars, we performed a 5-dimensional sigma-clipping routine using positional an kinematical data to interactively reject outliers and selected those stars well fitted by a Padova isochrone in $K_s \times (J - K_s)$ and $(J - H) \times (H - K_s)$ diagrams. Although a isochrone fitting solution was found, individual distances of stars close to the *turnoff point* or to the RGB range from 1.5 kpc to 4.4 kpc; $E(B-V)$ values range from 0.0 to 0.46; $[Fe/H]$ from -0.95 to 0.61 dex and radial velocities from 9 to 64 km/s. Besides, spectral types distribution of candidate member stars along the main sequence and the high dispersion in the parameters derived for them are inconsistent with what is expected for a coeval system. Our results suggest that ESO429-SC02 is a random overdensity of field stars along the line of sight.

[1] Physics Department - ICEx/UFMG (Brazil).

FAST AND SLOW RADIATION-DRIVEN WIND SOLUTIONS USING ZEUS-3D

I. Araya[1], M. Curé[1], A. ud-Doula[2], and A. Santillán[3]

Currently, the theory of radiation–driven winds of massive stars possess three known solutions for the velocity and density profiles of the stellar winds, namely: the fast, Ω–*slow* and δ–*slow* solutions. In order to confirm their stability we use a time–dependent numerical hydrodynamic code called ZEUS-3D, and then we compare their results with the stationary solutions from our numerical hydrodynamic code. ZEUS-3D needs an initial trial solution to start to integrate, for this we use the stationary solution (from our code) or a β–law for the velocity field. In both cases we obtain the same results. Fast and both slow stationary solutions are

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

attained in ZEUS-3D and are all stable. Furthermore, there is a very good agreement with the velocity and density fields from ZEUS-3D and our code, having differences between the terminal velocities lower than 3%.

In addition, we found that ZEUS-3D is very sensitive to the boundary conditions (base density and velocity profile), in some cases we obtain *kinks* in the velocity profiles, similar to the ones obtained by Madura et al. (2007) for stars with high rotation. Such kinks are most likely the result of the wind being mass overloaded, but further investigation is needed to understand its nature better.

Currently, we are exploring the effects of small perturbation at the base of the wind in order to study possible transitions or oscillations between δ–slow and fast solutions.

[1] Instituto de Física y Astronomía, Universidad de Valparaíso, Chile (ignacio.araya@uv.cl).
[2] Penn State Worthington Scranton, Dunmore, USA.
[3] DGTIC, Universidad Nacional Autónoma de México, Mexico City, Mexico.

EFFECTS OF NON-STANDARD NEUTRINO EMISSION ON THE EVOLUTION OF LOW-MASS STARS

S. Arceo-Díaz[1], K-P. Schröder[1], D. Jack[1], and K. Zuber[2]

Using the Pools et al. (1995) version of the STARS code with updated numerical tables for neutrino plasmon decay (Kantor et al. 2007), along with the reinterpretation of the Reimers mass-loss prescription by Schröder et al. (2005), we analyze the consequences of enhanced neutrino emission on the internal structure and late evolution of the degenerated cores in low-mass stars, the non-standard increase in tip-RGB luminosity and the impact on the calibration of the Reimers mass-loss mechanism and the changes driven in post-RGB phases. With synthetic spectra generated with the PHOENIX code Baron & Hauschildt et al. (1997), we also study the dependence of the non-standard increase in brightness on the selected NIR photometric band. By comparing our stellar evolutionary models with the synthetic spectra and the photometric data base of $\omega-$Cen by Sollima et al. (2004), we find the limit value $\mu_\nu \leq 2.2 \times 10^{-12}\mu_B$.

[1] Departamento de Astronomía, UGTO, Campus Guanajuato, apartado postal 36240, Guanajuato, México (santiago@astro.ugto.mx).
[2] Institut fur Kern- und Teilchenphysik, Technische Universitat Dresden, Zellescher Weg 19, D-01069 Dresden, Germany.

WIND STUDY OF B SGS STARS

C. Arcos[1], M. Curé[1], S. Kanaan[1], L. S. Cidale[2], and M. Haucke[2]

The estimation of the stellar and wind parameters of B SG stars, give us important information to understand their evolution. It is known from previous studies that the A type non-rotating (or slow rotator) SGs stars can have two types of solution: one fast and one slow. Here we study the two types of solutions for eight B SGs stars (HD41117, HD42087, HD79186, HD52382, HD80077, HD52382, HD75149, HD53138) using the hydrodynamics to calculate the velocity profile and using the modified version of FASTWIND to reproduce the H_α line profile. Finally, we compare these results with the β Law using FASTWIND and HDUST code. We obtained less mass loss values using FASTWIND than hydrodynamic ones (in a factor between 2-3). The Wind-Luminosity Relation agrees with Kudritzki et al. (1999) for the velocity profiles β type, but for the values found with hydrodynamics the relation has a negative slope. For the ratio v_∞/v_{esc}, we obtained as the v_{esc} increases the v_∞ decreases, like it was found by Curé et al. (2011) for δ-slow solutions.

[1] Departamento de Física y Astronomía, Universidad de Valparaíso, Valparaíso, Chile. (katalina.arcos@uv.cl).
[2] Instituto de Geofísica y Astronomía, Universidad Nacional de La Plata, La Plata, Argentina.

ON MAGNETIC FIELDS IN BAROTROPIC STARS

C. Armaza[1,*], A. Reisenegger[1], J. A. Valdivia[2], and P. Marchant[1,3]

Although barotropic matter does not constitute a realistic model for magnetic stars on short timescales, it would be interesting to confirm a recent conjecture that states that magnetized stars with a barotropic equation of state would be dynamically unstable (Reisenegger 2009). In this work we construct a set of barotropic equilibria, which can eventually be tested using a stability criterion. A general description of the ideal MHD equations governing these equilibria is summarized, allowing for both poloidal and toroidal magnetic field components. A new

finite-difference numerical code is developed in order to solve the so-called Grad-Shafranov equation describing the equilibrium of these configurations, and some properties of the equilibria obtained are briefly discussed.

[1] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile.
[2] Departamento de Física, Facultad de Ciencias, Universidad de Chile, Casilla 653, Santiago, Chile.
[3] Argelander Institut für Astronomie, Universität Bonn, Auf dem Hügel 71, D-53121, Bonn, Germany.
* cyarmaza@uc.cl

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

OWN SURVEY: RESULTS AFTER SEVEN YEARS OF HIGH-RESOLUTION SPECTROSCOPIC MONITORING OF SOUTHERN O AND WN STARS

R. Barbá[1], R. Gamen[2], J. I. Arias[1], N. Morrell[3], N. R. Walborn[4], J. Maíz Apellániz[5], A. Sota[5], and E. Alfaro[5]

We describe briefly the main results of the high-resolution spectroscopic monitoring survey of southern Galactic O- and WN-type stars. The high-resolution spectroscopic monitoring survey of O and WN stars (*OWN Survey*, Barbá et al. 2010) has completed seven years of sustained campaign, using observational facilities in Chile and Argentina. The selected sample corresponds to those stars for which there is no indication of multiplicity in the Galactic O-star Catalog (Maíz Apellániz et al. 2004) and the VII Catalogue of Galactic WR stars (van der Hucht 2001). We have collected almost 5000 spectra of about 240 O and WN stars. From that sample of 190 O-type stars, we have discovered 146 stars showing radial variations greater than 10 km/s, including 108 new systems, being 56 single-lined spectroscopic binaries, 43 double-lined spectroscopic binaries, and 9 multiple-lined binaries. The new orbital periods spanning from 1.5 to 2200 days. In this work, we present the main result of "OWN Survey": the determination of orbits for over fifty O-type spectroscopic binary systems, and the analysis of the spectral-type, luminosty, period, eccentricity, and mass-ratio distributions. This result is unprecedented in the context of massive binary stars, since we are almost doubling the number of Galactic O-type star systems with known orbits.

[1] Departamento de Física, Universidad de La Serena, Cisternas 1200 N, La Serena, Chile (rbarba@dfuls.cl).
[2] Instituto de Astrofísica de La Plata, Argentina.
[3] Las Campanas Observatory, Chile.
[4] Space Telescope Science Institute, USA.
[5] Instituto de Astrofísica de Andalucía-CSIC, Spain.

COLLISIONS BETWEEN GLOBULAR CLUSTERS

D. T. Belloni[1] and H. J. Rocha-Pinto[1]

The study of globular clusters (GC) plays an important role in our understanding of the Universe since these systems are true laboratories for theories of stellar dynamics and evolution. We are interested in studying a globular cluster formed by a collision between two different GC with NBODY6 (Aarseth, 2003). Firstly, in order to understand this code, we analyse how tidal streams form from a globular cluster in a circular orbit (on the disk) around the center of the Milky Way. In the next stage of this work we will study that collision. The stellar escape or capture from globular cluster can be understood with the Restricted Three Body Problem. These stars escape in a chaotic orbit, and in some cases may return (again in a chaotic orbit) to the cluster due to the Galactic potential. In most cases, such stars quickly alter their escape chaotic orbits to orbits that are similar to the parent cluster's orbit. Our results show an agglomeration of stars in a normal direction related to the direction towards the center of the Milky Way, forming thus a stream. We can explain this considering that a circular orbit around the dominant potential is the most likely orbit, since it requires minimum energy. In this coordinate systems, the tidal tails (or streams) rotates around the cluster center with the same mean motion associated to cluster around the Milky Way center.

[1] Observatório do Valongo, Universidae Federal do Rio de Janeiro, Ladeira Pedro Antonio 43, 20080-090 Rio de Janeiro, Brazil (diogo06@astro.ufrj.br).

SEARCHING FOR CYCLICAL PERIOD VARIATIONS IN CATACLYSMIC VARIABLE STARS

B. W. Borges[1], R. Baptista[2], and A. S. Oliveira[3]

Cataclysmic variables (CVs) are close binary systems where the late-type star (the secondary) overfills its Roche lobe and transfers matter to a white dwarf

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

(the primary) via an accretion disc. In this poster we report the first results of long-term project to study cyclical period variations in CVs. The observations were done from 2008 to 2013 at Observatório do Pico dos Dias (OPD/LNA, Brazil). Times series of high speed CCD photometry were obtained using the 0.6 m and 1.6 m telescopes at OPD. We measured new white-dwarf mid-eclipse timings and combined them with published measurements to construct updated observed-minus-calculated (O-C) diagrams. The UU Aqr O-C diagram covers 24 years of observations and presents a 26 yr modulation with semi-amplitude of 47 s. The V2051 Oph data cover 35 years of observations and the new timings show significant deviations from the published linear plus sinusoidal ephemeris (22 yr modulation with a semi-amplitude of 17 s), indicating that the variation is not strictly periodic. We discuss the observed modulations in context of the two current explanations for the phenomenon: magnetic activity in the secondary star and the presence of a third body in the system.

[1] Universidade Federal de Santa Catarina, Campus Araranguá, Rua Pedro João Pereira, 150, CEP88905-120, Araranguá, Brasil (bernardo.borges@ufsc.br).
[2] Departamento de Física, Universidade Federal de Santa Catarina, Campus Trindade, Florianópolis, Brasil.
[3] Instituto de Pesquisa & Desenvolvimento, Universidade do Vale do Paraíba, São José dos Campos, Brasil.

NEWLY DISCOVERED OLD OPEN CLUSTERS IN THE VVV SURVEY

J. Borissova[1], S. Ramírez Alegría[1], A. N. Chené[2], R. Kurtev[1], and VVV star cluster team

We report the discovery and fundamental parameters of 20 infrared open clusters projected in the inner disk and bulge area covered by the ESO public survey VISTA Variables in the Via Láctea (VVV). The most interesting candidates are as follow: The color-magnitude diagrams of VVV CL119, VVV CL143 and VVV CL150 show well defined red giant branch, some red clump and main sequence stars. They are projected at 6.8; 9.2 and 6.98 kpc respectively, are 5-10 Gyr old, intermediate metal poor, and could be classified as old open clusters. However, these objects in the inner few kpc from the Galactic center are quite unusual, because they should be rare in the inner Galaxy. Thus, these are promising candidates for new globular clusters in the galactic bulge. The open cluster candidates VVV CL124, VVV CL160 and VVV CL161 show well defined sequence of evolved and main sequence stars and are classified as old open clusters. They are projected at 5.0; 5.5 and 8.7 kpc respectively. The cluster candidates VVV CL139 and VVV CL140, are projected very close each to other, show similar radial velocities and distance modulus of 3.8 kpc. The age of CL139 is estimated around 80 Myr, while CL140 is older (1.3 Gyr). Both clusters are relatively metal rich, and are good new cluster pair candidate. And finally, two cluster candidates from our sample, namely VVV CL117 and VVV CL130 show typical color-magnitude diagrams of red supergiant clusters, but more data are necessary to confirm their nature. In summary, 15% of new cluster candidates from our sample have ages between 100 Myr and 1 Gyr and 50% are older than 1 Gyr. All clusters are very reddened, reaching A_V=28 mag in some of the cases.

[1] Departamento de Física y Astronomía, Universidad de Valparaíso, Av. Gran Bretaña 1111, Playa Ancha, Casilla 5030, Chile (jura.borissova@uv.cl.)
[2] Gemini Observatory, Northern Operations Center, 670 N. A' ohoku Place Hilo, HI 96720, USA.

UNVEILING TYPE IIB SUPERNOVA PROGENITORS: SN 2011HS FROM A SUPERGIANT STAR

F. Bufano[1]

Type IIb Supernovae are the final evolutionary stage of massive stars that were able to retain only a thin ($\lesssim$1 $M_\odot$) H/He external envelope at the time of the explosion. The mechanism of mass-loss that made such final structure possible and the nature of such progenitor stars are still open issues. We present the results obtained from the study of a sample of Type IIb SNe, in particular, of SN 2011hs (Bufano et al., 2013, MNRAS submitted). SN 2011hs was a relatively faint (M_B = -15.6 mag) and red Type IIb SN, characterized by a narrow light curve shape. Its spectral evolution showed the metamorphosis typical of this class of SN, from spectra dominated by H I lines to spectra where He I features dominate, but with broad absorption line profiles indicating high expansion velocities. Modeling the light curve of SN 2011hs and its velocity evolution with hydrodynamical calculations, we estimated that the SN is consistent with the explosion of a 3–4 $M_\odot$ He-core star, from a main sequence mass of 12–15 $M_\odot$, ejecting a ^{56}Ni mass equal to 0.04 $M_\odot$ and characterized by an explosion energy of $E \approx 8.5 \times 10^{50}$ erg s^{-1}.

Based on the light curve evolution, we assumed that the explosion occurred 6 days before the discovery (2,455,872 ± 4 JD), resulting in an adiabatic cooling phase lasting 8 days, similarly to SN 1993J. Since the duration and the decreasing rate of the cooling branch depends mainly on the progenitor size, we could infer from it a progenitor radius of ≈500–600 $R_\odot$, like a supergiant star. Our modeling rules out models with He core mass $> 5M_\odot$, i.e. main sequence masses above 20 $M_\odot$. Such a lower limit for the progenitor mass could indicate the possibility of a binary origin, although the radio light curve does not show strong deviations, typically signature of the presence of a companion star.

[1] Departamento de Ciencias Fisicas, Universidad Andrés Bello, Avda. República 252, Santiago (milena.bufano@gmail.com).

PHASE MIXING OF POPPED STAR CLUSTERS

G. N. Candlish[1], R. Smith[1], M. Fellhauer[1], B. K. Gibson[2], P. Kroupa[3], and P. Assmann[1]

As star clusters are expected to form with low star formation efficiencies, the gas in the cluster is expelled quickly and early in their development: the star cluster pops. This leads to an unbound stellar system. Previous N-body simulations have demonstrated the existence of a stepped number density distribution of cluster stars after popping, both in vertical position and vertical velocity, with a passing resemblance to a Christmas tree. Using numerical and analytical methods, we investigate the source of this structure, which arises due to the phase mixing of the out-of-equilibrium stellar system as it evolves in a background analytical potential. Considering only the vertical motions, we construct a theoretical model to describe the time evolution of the phase space distribution of stars in a Miyamoto-Nagai disk potential and a full Milky-Way type potential comprising bulge, halo and disk components, which is then compared with N- body simulations. Using our theoretical model, we investigate the possible observational signatures and the feasibility of detection.

[1] Departamento de Astronomía, Universidad de Concepción, Casila 160-C, Concepción, Chile (gcandlish@astro-udec.cl).
[2] Jeremiah Horrocks Institute, University of Central Lancashire, Preston, PR1 2HE, UK.
[3] Argelander Institut für Astronomie, Universität Bonn, Auf dem Hügel 71, D-53121 Bonn, Germany.

DETAILED DIFFERENTIAL CHEMICAL ANALYSIS OF A METAL POOR STAR: NEW EVIDENCES ABOUT PLANET FORMATION

M. G. C. C. Carlos[1], A. de C. Milone[1], and J. Meléndez[2]

The present project emphasizes on the study of metal-poor stars, with and without planets, to investigate the existence (or not) of a connection between anomalies in the chemical composition and the presence of planets by inspecting the high resolution spectra (R = 65 000), in order to derive chemical abundances with high precision using the differential technique. In this method, measurements of equivalent widths of the target star are compared to a standard star with predetermined photospheric parameters that are similar to those of the target star (effective temperature, surface gravity and metallicity). Therefore, we have compared the star HD111232 (standard) with HD020794, such that the first holds a hot Jupiter-type planet and around the second one there are three super-Earths. These solar-type stars are moderately metal-poor and had their spectra collected with the MIKE spectrograph at the 6.5m Magellan telescope in the Las Campanas Observatory. Among the main results, we have derived the classical photospheric parameters and chemical abundances of refractory and volatile elements with such a high precision, particularly with errors about 0.01 dex, which is essential for the study of chemical connection between planets and star. We have also added to the differential method the spectral synthesis of molecular bands and atomic lines to recover abundances of volatile elements such as carbon, nitrogen and oxygen. We thus present the parameters effective temperature, surface gravity, metallicity [Fe/H], microturbulence velocity and differential elemental abundances. For some elements, we have performed comparisons of the abundances measured by spectral synthesis with those obtained directly through measurements of equivalent widths. Specifically, the preliminary abundance difference δ[E/H] is 0.04(7) dex for carbon, 0.12(14) for nitrogen and 0.08(7) for oxygen.

[1] Divisão de Astrofísica, Instituto Nacional de Pesquisas Espaciaia, INPE, São José dos Campos, SP Brazil.
[2] Universidade de São Paulo, USP Brazil.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

SPECTRAL ANALYSIS OF THE CME OCCURRENCE SERIES

J. R. Cecatto[1], M. R. G. Guedes[1], and E. S. Pereira[1]

In order to investigate Coronal Mass Ejections (CMEs) in terms of either its pattern of occurrence or periodicities a new combination of techniques has been applied. It consists in the selection of a CMEs onset time continuous series obtained from the CDAW catalog for the years 2000-2012, covering a full cycle interval. The analysis has been made by a combination of: series spectral decomposition, periodic known components removal, and wavelet spectrum (WS) of the residual series. Spectral components are searched within the 95% confidence level. Application of WS becomes possible the identification of any component, and how long as well as when it is present in the series. Known periodic components identified in this and other studies are: 11-year, 6-year, 2.8-year, 1-year. Also, a 27-day component is well known. After removal of all known components, this investigation permitted us to identify a new component within the range of 16-64 days in the CMEs occurrence series. Beyond 64 days no component is observed. Identified component is intermittent in nature mainly from maximum up to the minimum of the 23rd solar cycle which corresponds to the interval 2000-2007. Then, it practically disappears till 2011 and 2012 when show up again. It has to be emphasized that the 16-64 days component became persistent in the interval 2006-2007. Interpretation of these is under preparation and will be published somewhere else.

[1] Divisão de Astrofísica, Instituto Nacional de Pesquisas Espaciais, C.P. 515, 12227-010, São José dos Campos-SP, Brasil (jrc@das.inpe.br).

A NEW LIBRARY OF THEORETICAL STELLAR SPECTRA FOR STELLAR POPULATION APPLICATIONS

P. Coelho[1]

Libraries of stellar spectra are one of the main ingredients of stellar population synthesis models. Theoretical libraries have been increasingly used in recent years to overcome limitations of empirical libraries, in particular to explore parameter space (in temperatures, metalicities and abundance patterns) not well covered by empirical libraries. In this talk, a new theoretical stellar library is presented. It consists of high and low-resolution spectra which cover the parameter space required to the modelling of stellar populations between 30 Myr and 14 Gyr, metalicities Z between 0.0017 and 0.0048, at both solar-scaled and α-enhanced compositions. The characteristics of the library as well as comparisons to observations will be presented.

[1] Universidade Cruzeiro do Sul.

THE VVV TEMPLATES PROJECT

R. Contreras Ramos[1], M. Catelan[1], F. Gran[1], C. Navarrete[1], R. Angeloni[1], J. Alonso-García[1], I. Dékány[1], G. Hajdu[1], M. Hempel[1], A. Jordán[1], B. Townsend[1], J. Borissova[2], C. Navarro[2], K. Pichara[1], S. Eyheramendy[1], and the VVV Templates Team.

Until now, stellar variability in the near-IR has been a relatively ill-explored research field. In particular, the number of high-quality light curves is very limited and, even worse, many variability classes have not yet been observed in a sufficiently extensive way in the near-IR, so that good light curves are entirely lacking for some such classes. Since VVV is the first ever large survey dedicated to stellar variability in the near-infrared, the first problem we had to face has thus been the construction of a proper statistically significant database of high-quality (i.e., template) near-IR light curves for a significant sample of stars taken to be representative of the different variability classes under study. The main purpose of the VVV Templates Project is thus to build a large database of well-defined, high-quality, near-IR light curves for variable stars of different types, which will form the basis of the VVV automated classification algorithms

[1] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile (rcontrer@astro.puc.cl).
[2] Departamento de Física y Astronomía, Facultad de Ciencias, Universidad de Valparaíso, Gran Bretaña 1111, Playa Ancha, Valparaíso, Chile.

EXTENSIVE MULTICONFIGURATION CALCULATIONS OF OSCILLATOR

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

STRENGTHS USEFUL FOR ASTROPHYSICS APPLICATIONS

A. Cruzado[1,2], O. H. Di Rocco[3,4], and P. E. Marchiano[1]

The goal of this work is to obtain oscillator strengths (gf) of spectral lines of astrophysical interest. In addition, we aim to estimate the effects of the uncertainties associated with obtaining gf values in the calculation of stellar abundances. In the atmospheres of chemically peculiar stars, it is critical the accurate determination of the abundance of some chemical elements, as well as their possible variations with the time. With this in mind, we intend to analyze spectral lines observed in the spectrum of He-weak, He-strong, HgMn, and Ap stars. In this work we present some preliminary results we have obtained for XeII lines. We compare the gf values theoretically obtained, by adopting the Hartree-Fock (HF) method and the Least Square Fitting (LSF) approach, with the gf values empirically obtained. The astrophysical oscillator strengths for XeII lines obtained by Yuce et al (2011), by fitting observed spectra of xenon-overabundant stars with synthetic spectra, are considered as the empirical gf values in the present work.

[1] Facultad de Ciencias Astonómicas y Geofísicas, Universidad Nacional de La Plata (UNLP), Paseo del Bosque s/n, 1900 La Plata, Pcia. de Buenos Aires, Argentina (acruzado@fcaglp.unlp.edu.ar).
[2] Instituto de Astrofísica de La Plata, Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), UNLP, Paseo del Bosque s/n, 1900 La Plata, Pcia. de Buenos Aires, Argentina.
[3] Instituto de Física de Arroyo Seco, Universidad Nacional del Centro de la Pcia. de Buenos Aires, Pinto 399, 7000 Tandil, Pcia. de Buenos Aires, Argentina.
[4] CONICET, Av. Rivadavia 1917 (C1033AAJ), Ciudad Autónoma de Buenos Aires, Argentina.

A NEW METHOD TO DISENTANGLE THE ROTATIONAL VELOCITIES OF STARS: APPLICATION TO MAIN–SEQUENCE FIELD STARS

M. Curé[1], D. F. Rial[2], J. Cassetti[3], and A. Christen[4]

The projected rotational velocity $v \sin i$ is a fundamental observable quantity. In order to obtain the rotational velocity distribution of a sample of $v \sin i$, Chandrasekhar & Münch (1950) developed a formalism to obtain this distribution under the assumption that rotational axes are uniformly distributed, but this method is not usually applied due to an intrinsic numerical problem associated to the derivative of an Abel's integral. An alternative iterative method was developed by Lucy (1974) to disentangle the distribution function of this kind of inverse problem, but this method has no convergence criteria.

Here we present a new method to disentangle the distribution of rotational velocities, based on Chandrasekhar & Münch (1950) formalism. We obtain the cumulative distribution function (CDF) of the rotational velocities from projected velocities ($v \sin i$) under the standard assumption of uniform distributed rotational axes. Through simulations the method is tested using a) theoretical Maxwellian distribution functions for the rotational velocity distribution and b) with a sample of about 12.500 main-sequence field stars.

Our main results are:
The method is robust and in just one step gives the cumulative distribution function of rotational velocities.
When applied to theoretical distributions it recovers the CDF with very high confidence.
When applied to *real* data, we recover the results from Carvalho et al. (2009) proving that the velocity distribution function of main–sequence field stars is *non–Maxwellian* and are better described by Tsallis or Kaniadakis distribution functions.

[1] Instituto de Física y Astronomía, Universidad de Valparaíso, Chile (michel.cure@uv.cl).
[2] Departamento de Matemáticas, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina.
[3] Universidad Nacional de General Sarmiento, Argentina.
[4] Instituto de Estadística, Pontificia Universidad Católica de Valparaíso, Chile.

THE GENERAL CATALOG OF VISTA VARIABLES IN THE VIA LACTEA

I. Dekany[1], J. Pullen, D. Minniti, and M. Catelan

The VISTA Variables in the Via Lactea (VVV) ESO Public Survey is providing deep, long-baseline time-series photometry in the near-infrared for hundreds of millions of objects in the bulge and the southern disk. The scientific potential of these data is manifold, and its global exploration requires homogeneous and high-level data products. In my talk, I will expound on the details of a massive computational effort to produce a general variability database and a catalog of periodic and transient variables in

the bulge, using photometry provided by the VISTA Data Flow System. The goal of this project is to duly provide science-ready data products in the form of a simple on-line database which may serve as the basis for various specific studies from stellar pulsation to microlensing, conducted by the VVV community. I will discuss the main steps of the procedure, the characteristics and possible uses of the database, the current status of the project, and will conclude by highlighting selected results.

[1] Instituto de Astrofisica, Pontificia Universidad Catolica de Chile.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

PARAMETERS FOR SMC CLUSTERS FROM CMD MODELING

B. Dias[1,2], L. Kerber[1,3], B. Barbuy[1], B. Santiago[4], S. Ortolani[5], and E. Balbinot[4]

Stellar clusters in the Small Magellanic Cloud are fundamental pieces to study the chemical and dynamical evolution of this neighbouring dwarf galaxy, enabling inspection of a large period covering ∼10 Gyr. The main goals of this work are the derivation of age, metallicity, distance modulus, reddening, core radius and central density profile for each cluster, and place them in the context of the Small Cloud evolution. The studied clusters are: AM 3, HW 1, HW 34, HW 40, Lindsay 2, and Lindsay 3, where HW 1, HW 34, and Lindsay 2 are studied for the first time. Optical colour-magnitude diagrams (V, B-V CMDs) and radial density profiles were built from images obtained with the 4.1m SOAR telescope, reaching V ∼ 23. The determination of structural parameters were carried out applying King profile fitting. The other parameters were derived in a self-consistent way by means of isochrone fitting, which uses the likelihood statistics to identify the synthetic CMDs that best reproduce the observed ones. Membership probabilities were determined comparing the cluster and control field CMDs. Completeness and photometric uncertainties were obtained performing artificial star tests. The results confirm that these clusters (except HW 34, identified as a field fluctuation) are intermediate-age clusters, with ages between ∼1 and ∼5 Gyr. Their metallicities follow the age-metallicity relation by Pagel & Tautvaisiene (1998), with some spread as described by Parisi (2009) and Piatti (2011). In particular HW 1, Lindsay 2, and Lindsay 3 are located in a region that we called West Halo. (Based on paper by Dias et al. 2013, A&A, accepted; arXiv: 1311.4579).

[1] IAG, Universidade de São Paulo, Brazil.
[2] ESO, Chile.
[3] LATO-DCET-UESC, Brazil.
[4] Universidade Federal do Rio Grande do Sul, Brazil.
[5] Universitá di Padova, Italy.

A PSF-FITTING PIPELINE FOR VVV-ESO: THE STAR CLUSTER PISMIS 24

R. A. G. Dias[1] and C. Bonatto[1]

Este trabalho apresenta um algoritmo para a extração de dados fotométricos do catálogo *"VISTA Variables in the Via Láctea"* (VVV) do ESO. A principal característica do algoritmo é evitar a interação com o usuário mantendo precisão e profundidade fotométrica, de fato o algoritmo foi capaz de gerar dados mais precisos para as estrelas menos brilhantes (J $\gtrsim$ 16, H $\gtrsim$ 15,5 e H $\gtrsim$ 15) e confiável fotometria para estrelas mais de uma magnitude mais fracas do que as detectáveis com outras técnicas. Embora o algoritmo obtenha resultados menos precisos para as estrelas mais brilhantes, este provou ser o método mais adequado, uma vez que queremos trabalhar com aglomerados abertos jovens, onde a pré-sequência principal é de maior importância. Além disso, podemos combinar 2MASS e VVV para substituir as estrelas saturadas do VVV.

[1] UFRGS.

PROPER MOTIONS OF PRE-MAIN SEQUENCE STARS

A. C. S. Ferreira[1], R. Teixeira[1], C. Ducourant[2], P. A. B. Galli[1], J. F. Le Campion[2], and M. Fidêncio[1]

The kinematic study of young stars is an important tool to discuss the early stages of star formation. In this context, proper motions allow us to detect moving group structures of young stars to which they belong. Individual distances to moving group members can be inferred from proper motion and radial velocity data using the convergent point strategy. The main objective of this work is to determine proper motions of pre-main sequence stars in nearby star-forming regions. This work represents an improvement of an existing database by including more pre-main sequence stars and refining the astrometry for

stars with poor proper motion information in the literature. We calculate the stellar proper motions from observations performed with the CCD meridian circles located at the Abrahão de Moraes Observatory (Valinhos, SP) and the Bordeaux Observatory, and also use data from the literature. Here we discuss the accuracy of our results and compare them with published astrometric catalogs.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Brasil (andcris@usp.br, rama.teixeira@iag.usp.br).
[2] Observatoire de Bordeaux, France.

CLASSICAL CEPHEIDS FROM LONG-BASELINE INTERFEROMETRY: DIAMETERS, DISTANCES, CIRCUMSTELLAR ENVELOPES AND BINARITY

A. Gallenne[1], P. Kervella[2], A. Mérand[3], and J. Breitfelder[2,3]

Optical interferometry is the only technique giving access to milli-arcsecond resolution at optical/infrared wavelengths. For Cepheids, this is a powerful and unique tool to measure distances in a pseudo-geometric way, and probe the close circumstellar environment.

While the measured mean angular diameter allows us to probe the pulsation mode, its angular and linear variation can provide the distance to the star. Independent distance measurements are particularly important because classical Cepheids are used as primary distance indicator in the Local Group.

Interferometry also offers the possibility to probe the close environment of these stars, and so study their circumstellar envelopes (CSEs) and the companions. The characterization of the CSEs is particularly important as they give access to the present mass loss rate of Cepheids. These CSEs were probably formed through past or ongoing mass loss, possibly generated by shock waves in the pulsating atmosphere of the Cepheid. Their presence can also bias the distance estimate through the Baade-Wesselink method. Finally, when Cepheids are in binary systems, we can investigate their age and evolution, estimate the mass and distance, and constrain evolution and pulsation models. However, most of the companions are located too close to the Cepheid ($\sim$ 1-40 mas) to be observed with a 10-meter class telescope. The only way to spatially resolve such systems is to use long-baseline interferometry or aperture masking.

[1] Universidad de Concepción, Departamento de Astronomía, Casilla 160-C, Concepción, Chile (agallenne@astro-udec.cl).
[2] LESIA, Observatoire de Paris, CNRS UMR 8109, UPMC, Université Paris Diderot, 5 Place Jules Janssen, F-92195 Meudon, France.
[3] European Southern Observatory, Alonso de Córdova 3107, Casilla 19001, Santiago 19, Chile.

TWIN-PEAK QUASI-PERIODIC OSCILLATIONS IN X-RAY BINARIES: CLUES FROM THEIR AMPLITUDE AND COHERENCE

C. Germanà[1], R. Casana[1], M. M. Ferreira Jr[1], and A. R. Gomes[2]

Low-mass X-ray binaries (LMXBs) with either a black hole or a neutron star show power spectra characterized by several enhanced fractions of power at given frequencies, such as quasi-periodic oscillations (QPOs). Twin-peak high-frequency QPOs (HF QPOs) are typical of the orbital motion time-scale for matter orbiting within 10 r_g from the compact object ($r_g = GM/c^2$ is the gravitational radius of the compact object). Thus, such modulations could arise from the energy released by accreting clumps of matter interacting with the strong gravitational field of the compact object. Twin-peak HF QPOs are characterized by their central frequency ν, root mean square amplitude (rms) and coherence $Q = \nu/\Delta\nu$, where $\Delta\nu$ is the width of the peak. Here we investigate on the characteristic behavior of the rms observed in several LMXBs. We highlight the work done by the strong tidal force as root source of the energy (rms) released by a QPO. By means of the Schwarzschild potential we estimate the maximum allowed radius of clumps of matter that can survive to tides in the inner part of the accretion disk. It turns to be $R \sim 40$ m for matter in an accretion disk around a 2 $M_\odot$ neutron star and $R \sim 150$ m for matter around a 10 $M_\odot$ black hole. The work loaded by tides on the clump of matter depends on the Schwarzschild potential shape for the given orbit. We highlight that for orbits approaching to the inner most stable circular orbit (ISCO) the changing Schwarzschild potential shape may account for the observed behavior of the energy (rms) carried by the twin-peak HF QPOs.

[1] Departamento de Física, Universidade Federal do Maranhão, São Luís, Brasil (claudio.germana@gmail.com).
[2] Departamento de Física, Instituto Federal do Maranhão, São Luís, Brasil.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

OPTICAL/NEAR-INFRARED LIGHT-CURVE PROPERTIES OF PULSATING VARIABLES IN THE CEPHEID INSTABILITY STRIP

G. Hajdu[1,2], I. Dékány[1,2], M. Catelan[1,2], and D. Calderón Espinoza[1]

Making the distinction between Type I and II Cepheids found in the Vista Variables in the Via Lactea (VVV) ESO Public Survey is crucial for the studies of Galactic structure using these variables. As VVV provides only K_S-band light curves, this distinction has to be based on near-IR light-curve properties.

Because of their reduced amplitudes in the near-IR, however, it is not immediately obvious whether such a distinction can be unambiguously made. To assess this problem, we have compared the VVV and VVV Templates K_S-band light-curve properties of 213 Type I and 215 Type II Cepheids using Fourier decomposition. The Fourier parameters of these types were found to be different enough for the purposes of classification. For example, over most of the Cepheid period range, there is an upper limit for the amplitudes of Type I Cepheids. As 50 percent of the Type II variables lie above this limit, half of the variables that could be confused with Type I Cepheids are sorted out by this simple feature alone, suggesting that the automatic classification schemes under development for the VVV Survey will be able to classify such variables with a high degree of accuracy.

We have also found that bump Cepheids can be easily identified using VVV data, as the bump feature also appears in the near-IR light curves. Detailed modeling of the light curves of the bump Cepheids found in the VVV data will provide accurate stellar parameters for these stars.

[1] Instituto de Astrofísica, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile (ghajdu@astro.puc.cl).
[2] The Milky Way Millennium Nucleus, Santiago, Chile.

ON THE ORIGIN OF THE WIND VARIABILITY OF 55 CYG

M. Haucke[1], M. Kraus[2], R. O. J. Venero[1], S. Tomić[2], L. S. Cidale[1], D. H. Nickeler[2], and M. Curé[3]

The early B-type supergiant 55 Cygni exhibits pronounced night-to-night variations in its Hα P-Cygni line profile, probably related to a strong variable stellar wind. In this work we studied a sample of spectroscopic observations, taken at the Observatory of Ondřejov (Czech Republic), in order to analyze the variations in the stellar and wind parameters. The observations were modeled using FASTWIND code (Santolaya-Rey, Puls & Herrero 1997, A&A 323, 488-512). Although we were not able to find an exact period from the Hα line profile variations, the same pattern (shape and intensity) seems to have a cyclic behaviour of about 17 days. The values for the wind and stellar parameters suggest changes of the mass loss rate by a factor of three during a cycle of variability. On the other hand, Kraus et al. (Precision Asteroseismology Proceedings, IAU Symposium 301, 2014) found that the HeI λ6678 photospheric absorption line presents a 1.09 day period, which could be superimposed over a longer period. From the analysis of our theoretical parameters we found that a gravitational mode of pulsation could not be the only agent responsible for the observed variations. As the stars evolving from the main sequence to the red supergiant stage (RSG) have different pulsation properties than those evolving back to the blue supergiant region (Saio, Georgy & Meynet, 2013, MNRAS, 433, 1246), we conclude that 55 Cygni could be in a post-RSG phase with multiperiodic pulsation modes. The variable mass loss could be attributed to the coupling of the oscillation modes.

[1] Facultad de Ciencias Astronómicas y Geofícas, UNLP, and Instituto de Astrofísica La Plata, CONICET-UNLP, La Plata, Argentina, (mhaucke@fcaglp.unlp.edu.ar).
[2] Astronomický ústav, Akademie věd České Republiky, Ondřejov, Czech Republic.
[3] Departamento de Física y Meteorología, Facultad de Ciencias, Universidad de Valparaíso, Chile.

NIP OF STARS: EARLY RESULTS AND NEW ECLIPSING BINARIES

M. Jaque Arancibia[1], R. H. Barba[2], N. Morrell[3], A. Roman Lopes[2], S. Torres Robledo[2], G. Gunthardt[4], M. Soto[5], G. Ferrero[6], J. I. Arias[2], R. Gamen[7], and E. Fernadez Lajus[7]

We have performed a near-infrared photometric monitoring of 39 galactic young star clusters and star-forming regions, known as *NIP of Stars*, between the years 2009–2011, using the Swope telescope at Las Campanas Observatory (Chile) and the RetroCam camera, in H- and Y-bands. This monitoring program is complementary to the *Vista*

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

Variables in the Via Láctea (*VVV*), as the brightest sources observed in *NIP of Stars* are saturated in *VVV*. The aim of this campaign is to perform a census of photometric variability of such clusters and star-forming regions, with the main goal of discovering massive eclipsing binary stars. In this work, we present a preliminary analysis of this photometric monitoring program with the discovery of tens of candidates for variable stars, among them candidates for massive eclipsing binaries. We included also to the analysis of variability, a small set of images obtained in the Ks with the VISTA telescope in the framework of *VVV* survey (Minniti et al. 2010). In special, we announce the infrared discovering of four massive eclipsing binaries in the massive young cluster NGC 3603. The stars have been classified spectroscopically as O-type stars, and one of them, MTT 58, has a rare star with a spectral type of O2 If*/WN6, as one of its components. We present a preliminary analysis of the light-curves of these binaries.

[1] ICATE-CONICET, Argentina.
[2] Universidad de La Serena, Chile.
[3] Las Campanas Observatory, Chile.
[4] Observatorio de Cordoba, Argentina.
[5] STScI, USA.
[6] FCAGLP, Universidad Nacional de la Plata, Argentina.
[7] IALP-CONICET, Argentina.

WHITE DWARF STARS IN THE JPAS SURVEY DETECTION - MASS DETERMINATION - TEMPERATURE DETERMINATION

A. Kanaan[1], T. Schmitz[1], E. J. Alfaro[2], S. Daflon[3], C. B. Pereira[3], M. Borges Fernandes[3], T. Aparicio Villegas[3], D. R. Gonçalves[4], S. Lorenz-Martins[4], W. Marcolino[4], T. Ribeiro[5], A. Ederoclite[6], H. Vázquez Ramió[6], D. Martínez-Delgado[6], and the JPAS Collaboration

White dwarfs are the end state of all main sequence stars less massive than $8M_{\odot}$, which means that 98% of all stars will end up as white dwarfs. First and foremost, J-PAS will allow us to discover many new white dwarfs. It will go deeper than SDSS; most of SDSS spectroscopically confirmed white dwarfs have a magnitude below 20.5, while J-PAS will be complete (5σ detections) down to 22.5 in each filter. So we should see white dwarfs 2.5 times farther than SDSS and therefore the total volume will be (2.5^3 - 1 = 14.6 times larger. By definition every object in J-PAS will be spectroscopically observed, while in SDSS only chosen objects had their spectra taken, so our white dwarf sample will also be much more complete than SDSS. We expect to increase the total number of white dwarfs from approximately 20,000 to 300,000. Among our goals are the study of the white dwarf luminosity function and the mass distribution.

[1] Departamento de Física, Universidade Federal de Santa Catarina. CP476 - 88040900 - Florianópolis - SC - Brazil.
[2] Instituto de Astrofísica de Andalucía. Spain.
[3] Observatório Nacional, Ministério de Ciência e Tecnologia. Brazil.
[4] Observatório do Valongo, Universidade Federal do Rio de Janeiro. Brazil.
[5] Universidade Federal de Sergipe. Brazil.
[6] Centro de Estudios de Fisica del Cosmos de Aragón. Spain.

WHITE DWARF STARS

S. O. Kepler[1]

White dwarfs are the evolutionary endpoint for nearly 95% of all stars born in our Galaxy, the final stages of evolution of all low- and intermediate mass stars, i.e., main sequence stars with masses below $(8.5 \pm 1.5)\,M_{\odot}$, depending on metallicity of the progenitor, mass loss and core overshoot. Massive white dwarfs are intrinsically rare objects, tand produce a gap in the determination of the initial vs. final mass relation at the high mass end (e.g. Weidemann 2000 A&A, 363, 647; Kalirai et al. 2008, ApJ, 676, 594; Williams, Bolte & Koester 2009, ApJ, 693, 355). Main sequences stars with higher masses will explode as SNII (Smartt S. 2009 ARA&A, 47, 63), but the limit does depend on the metallicity of the progenitor. Massive white dwarfs are probably SNIa progenitors through accretion or merger. They are rare, being the final product of massive stars (less common) and have smaller radius (less luminous). Kepler et al. 2007 (MNRAS, 375, 1315), Kleinman et al. 2013 (ApJS, 204, 5) estimate only 1-2% white dwarfs have masses above 1 $M_{\odot}$. The final stages of evolution after helium burning are a race between core growth and loss of the H-rich envelope in a stellar wind. When the burning shell is exposed, the star rapidly cools and burning ceases, leaving a white dwarf. As they cool down, the magnetic field freezes in, ranging from a few kilogauss to a gigagauss. Peculiar type Ia SN 2006gz, SN 2007if, SN 2009dc, SN 2003fg suggest progenitors in the range $2.4 - 2.8\ M_{\odot}$, and Das U. & Mukhopadhyay B. (2012, Phys. Rev. D, 86, 042001) estimate that the Chandrasekhar limit increases to $2.3 - 2.6\ M_{\odot}$ for extremely high magnetic

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

field stars, but differential rotation induced by accretion could also increase it, according to Hachisu I. et al. 2012 (ApJ, 744, 69). García-Berro et al. 2012, ApJ, 749, 25, for example, proposes double degenerate mergers are the progenitors of high-field magnetic white dwarfs. We propose magnetic fields enhance the line broadening in WDs, causing an overestimated surface gravity, and ultimately determine if these magnetic fields are likely developed through the star's own surface convection zone, or inherited from massive Ap/Bp progenitors. We discovered around 20 000 spectroscopic white dwarfs with the Sloan Digital Sky Survey (SDSS), with a corresponding increase in relatively rare varieties of white dwarfs, including the massive ones (Kleinman et al. 2013, ApJS, 204, 5, Kepler et al. 2013, MNRAS, 439, 2934). The mass distributions of the hydrogen-rich (DA) measured from fitting the spectra with model atmospheres calculated using unidimensinal mixing lenght-theory (MLT) shows the average mass (as measured by the surface gravity) increases apparently below 13 000K for DAs (e.g. Bergeron et al. 1991, ApJ, 367, 253; Tremblay et al. 2011, ApJ, 730, 128; Kleinman et al. 2013). Only with the tridimensional (3D) convection calculations of Tremblay et al. 2011 (A&A, 531, L19) and 2013 (A&A, 552, 13; A&A, 557, 7; arXiv 1309.0886) the problem has finally been solved, but the effects of magnetic fields are not included yet in the mass determinations. Pulsating white dwarf stars are used to measure their interior and envelope properties through seismology, and together with the luminosity function of white dwarf stars in clusters and around the Sun are valuable tools for the study of high density physics, and the history of stellar formation.

[1] Universidade Federal do Rio Grande do Sul, Brazil.

LINE IDENTIFICATION IN THE SUN'S SPECTRUM

J. R. Kitamura[1] and L. P. Martins[1]

Synthetic stellar spectra are extensively used for many different applications in astronomy, from determining atomic parameters of new observed stars to the study of the stellar populations of galaxies. One of the inputs for the codes that generate these synthetic spectra are atomic and molecular line lists, which contain the atomic parameters of the absorption lines that should appear in each spectrum. Although these lists contain million of lines, very few of them were actually measured in laboratory. The consequence is that for many lines the errors in the parameters can be as large as 200%. Besides that, we do not know all the lines that appear in the stars. Even for the Sun, our closest and most studied star, the synthetic spectra misses many lines. This is one of the main reasons we still cannot reproduce the spectrum of observed stars. In this project we will develop a careful strategy to compare the synthetic and observed spectrum of the Sun to try to identify and quantify the lines still missing in the models. We will also try to identify lines with large errors in the atomic parameters, as for example, lines in which the central wavelength is wrong.

[1] Núcleo de Astrofísica Teórica, Universidade Cruzeiro do Sul, Campus Liberdade, Rua Galvão Bueno, 868, Liberdade, São Paulo, Brasil (jreiskitamura@gmail.comunam.mx).

PRE-MAIN SEQUENCE EVOLUTIONARY TRACKS AND ISOCHRONES IN COLOR-MAGNITUDE DIAGRAMS

N. R. Landin[1,3], L. T. S. Mendes[2,3], and L. P. R. Vaz[3]

We presented non-gray pre-main sequence evolutionary tracks and isochrones in theoretical and observational Hertzsprung-Russel diagrams. Theoretical tracks were generated by ATON2.4 code (Landin et al., 2006, A&A, 456, 269) for the mass interval of 0.15-3.8 $M_\odot$ and metallicities of [Fe/H]=−0.24, 0.0 and +0.37. By using color-temperature relations and bolometric corrections in UBVRIJHKL (Bessel et al. 1998, A&A, 333, 231) and BVRI (VadenBerg & Clem, 2003, AJ, 126, 778) photometric systems, we converted theoretical tracks and isochrones to their counterparts in color-magnitude diagrams (CMD). Tracks in theoretical and observational Hertzsprung-Russel diagrams show the well known shift, in main sequence, to smaller temperatures (or higher V−I) with increasing metallicity. The tracks obtained with both transformations behave roughly the same way for larger masses, but for M< 0.8 $M_\odot$ Bessel's transformations return B−V colors in disagreement with observations and theory especially for cool stars and it can be due to the opacity incompleteness in the blue and UV. Finally, our tracks and isochrones in CMD were used to investigate the evolutionary status of a multiple system and a young cluster. η Mus is a 22 Myr old system, consisting of two late B-type stars of 2.9 $M_\odot$ each and a 0.79 $M_\odot$ pre-main

sequence star. We estimated that NGC 2264 stars have masses, mainly, in the range 0.1-0.6$M_\odot$ and the mean age of stars' cluster is 3.5 Myr, what is in agreement with other works.

[1] Universidade Federal de Viçosa, Campus UFV Florestal, CEP 30690-000, Florestal, Minas Gerais, Brasil (nlandin@ufv.br).
[2] Depto. de Engenharia Eletrônica, Universidade Federal de Minas Gerais, CEP 31270-901, Belo Horizonte, Minas Gerais, Brasil (luizt@cpdee.ufmg.br).
[3] Depto. de Física, Universidade Federal de Minas Gerais, CEP 31270-901, Belo Horizonte, Minas Gerais, Brasil (lpv@fisica.ufmg.br).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

UNVEILING OPTICAL AND X-RAY PROPERTIES OF THE HIGH MASS X-RAY BINARY XMMU J054134.7-682550

R. Lopes de Oliveira[1] and V. M. Placco[2,3]

XMMU J054134.7-682550 is an X-ray source located in the Large Magellanic Cloud. Based on its X-ray properties, and from optical and near-infrared photometry, it was assumed to be a Be/X-ray binary. In this work we present the characterization of its optical counterpart from optical medium-resolution spectra acquired with the 3.6-m New Technology Telescope and the 4.1-m SOAR Telescope. Photospheric lines along with strong emission lines from the Hα, Hβ and several transitions of iron show that the optical counterpart is a Be star with a dense or large circumstellar disk. Thus, it is now conclusive that the system is indeed a Be/X-ray binary. Additionally, we present an ongoing program which aims to improve the characterization of the system from XMM-*Newton*, Swift/BAT and ASM/RXTE X-ray observations.

[1] Departamento de Física, Universidade Federal de Sergipe, Av. Marechal Rondon s/n, 49100-000, São Cristóvão, SE, Brazil (rlopes@ufs.br).
[2] National Optical Astronomy Observatory, Tucson, AZ 85719, USA.
[3] Departamento de Astronomia, Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo, Rua do Matão 1226, Cidade Universitária, 05508-090 São Paulo, SP, Brazil.

IN SEARCH OF PRECISE ISOCHRONAL AGES: MONTE CARLO AND BAYESIAN APPROACH

D. Lorenzo-Oliveira[1] and G. F. Porto de Mello[1]

Obtaining accurate ages for FGK stars is important to understand the Galactic structure and evolution as well as the evolution of exoplanetary systems. We build a dense grid of isochrones and evolutionary tracks aimed to identify, in several spectroscopic surveys, which are the most reliable stellar ages based on solid statistics. For this, we calculate their probability distributions of isochronal age and fundamental parameters such as mass, radius (at ZAMS) and surface gravity through Monte Carlo simulations and Bayesian inference. From these determinations, we will be able to derive a sample of MS and subgiant stars with very accurate isochronal ages covering an extensive domain of ages, masses and metallicities. This sample will be very useful for future observational follow-ups and, moreover, when applied to age-activity-rotation relationships will enable the construction of robust age calibrations for solar-type stars. Such calibrations of age and activity might contribute towards the establishment of firmer relations governing the evolution of angular momentum in solar-type stars.

[1] Observatório do Valongo, Universidade Federal do Rio de Janeiro, Ladeira do Pedro Antonio, 43, CEP: 20080-090, Rio de Janeiro, Brazil (diego@astro.ufrj.br).

SYMBIOTIC STARS IN X-RAYS AND UV

G. J. M. Luna[1], J. L. Sokoloski[2], K. Mukai[3], T. Nelson[4], and N. E. Nuñez[5]

Until recently, symbiotic binary systems in which a white dwarf accretes from a red giant were thought to be mainly a soft X-ray population. I will describe the detection with the Swift/XRT of 14 white dwarf symbiotics that were not previously known to be X-ray sources. The 14 new X-ray detections were the result of a survey of more than 50 symbiotic stars using Swift fill-in programs during three years. Their X-ray spectra are consistent with thermal emission and fall naturally into three distinct groups. The first group contains those sources with a single, highly absorbed hard component, which we identify as probably coming from an accretion-disk boundary layer. The second group is composed of those sources with a single, soft X-ray spectral component, which likely arises in a region where low-velocity shocks produce X-ray emission, i.e. a colliding-wind region. The third group consists of those sources with both hard and soft X-ray spectral components. Simultaneous Swift/UVOT data allowed us to find that unlike in the optical, where

rapid, stochastic brightness variations from the accretion disk typically are not seen, detectable UV flickering is a common property of symbiotic stars. Supporting our physical interpretation of the two X-ray spectral components, the UV photometry shows that symbiotic stars with harder X-ray emission tend to have stronger UV flickering, which is usually associated with accretion through a disk.

[1] Instituto de Astronomia y Física del Espacio, CONICET.
[2] Columbia University.
[3] NASA/GSFC & USRA.
[4] University of Minnesota.
[5] Instituto de Ciencias Astronómicas, de la Tierra y del Espacio.

PHOTOMETRIC ANALYSIS OF GALACTIC STELLAR CLUSTERS IN VVV SURVEY

F. Mauro[1], C. Moni Bidin[1,2], R. E. Cohen[1], D. Geisler[1], S. Villanova[1], and A. N. Chené[3]

We show the preliminary results of the study of the structure of the Horizontal Branch of Liller 1 and some results from the Calcium Triplet method using Ks magnitude applied to several Galactic Globular clusters using data from the VISTA Variables in the Via Lactea Survey (Minniti et al. 2010) and obtained with GeMS/GSAOI. The data are extracted with the new automatic VVV-SkZ_pipeline photometric pipeline (Mauro et al. 2013).

[1] Universidad de Concepcion, Chile.
[2] Universidad Catolica del Norte, Antofagasta, Chile.
[3] Gemini Observatory, Hawaii, USA.

ATMOSPHERIC STRATIFICATION SIGNS IN NON-LTE OF ^3HE AND ^4HE IN THE BP STAR A CEN

N. L. Maza[1], M. F. Nieva[2,3], N. Przybilla[3], and H. Levato[1]

We have analyzed a high-resolution and high-S/N UVES spectrum of the Bp star a Centauri (He-variable) by means of state-of-the-art non-LTE spectral synthesis. Atmospheric parameters were determined in an iterative way via ionization equilibria of OI/II and FeII/III and the matching of several Balmer lines simultaneously. Because of chemical stratification and the presence of ^3He, the He lines are not matched with a standard model atmosphere. A new He model atom accounting for the ^3He isotope and an empirically solution for the He stratification in the line-formation calculations allow us to characterize this star in a more realistic manner than do classical models.

[1] Instituto de Ciencias Astronomicas, de la Tierra y del Espacio (ICATE), San Juan, Argentina (nmaza@icate-conicet.gob.ar).
[2] Remeis-Sternwarte & ECAP, University of Erlangen-Nuremberg, Germany.
[3] Institute of Astro-and Particle Physics, University of Innsbruck, Austria.

STELLAR MODELS OF ROTATING, PMS STARS WITH MAGNETIC FIELDS

L. T. S. Mendes[1,3], N. R. Landin[2,3], and L. P. R. Vaz[3]

We report our ongoing studies of the magnetic field effects on the structure and evolution of low-mass stars, using a method first proposed by Lydon & Sofia (1995, ApJS 101, 357) which treats the magnetic field as a perturbation on the stellar structure equations. The `ATON 2.3` stellar evolution code (Ventura et al. 1998, A&A 334, 953) now includes, via this method, the effects of an imposed, parametric magnetic field whose surface strength scales throughout the stellar interior according to one of the three following laws: (a) the ratio between the magnetic and gas energy densities, $\beta_{\rm mg}$, is kept at its surface value across the stellar interior, (b) $\beta_{\rm mg}$ has a shallower decrease in deeper layers, or (c) $\beta_{\rm mg}$ decays as $[m(r)/M_\star]^{2/3}$. We then computed rotating stellar models, starting at the pre-main sequence phase, of 0.4, 0.6, 0.8 and 1.0 $M_\odot$ with solar chemical composition, mixing-length convection treatment with α=Λ/H_P=1.5 and surface magnetic field strength of 50 G. Summarizing our main findings: (1) we confirm that the magnetic field inhibits convection and so reduces the convective envelope; (2) the magnetic perturbation effect dominates over that of rotation for 0.8 and 1.0 $M_\odot$ masses, but their relative impact shows a reversal during the Hayashi tracks at lower masses (0.4 and 0.6 $M_\odot$); in any case, the magnetic perturbation makes the tracks cooler; and (3) the magnetic field contributes to higher surface lithium abundances.

[1] Departamento de Engenharia Eletrônica, Universidade Federal de Minas Gerais, Belo Horizonte (MG), Brazil (luizt@cpdee.ufmg.br).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

[2] Universidade Federal de Viçosa, Campus UFV Florestal, Florestal (MG), Brazil (nlandin@ufv.br).
[3] Departamento de Física, Universidade Federal de Minas Gerais, Belo Horizonte (MG), Brazil (lpv@fisica.ufmg.br).

ESTIMATING THE MEAN INCLINATION OF ROTATIONAL AXES OF THE PLEIADES

D. Miranda[1,2], B. B. Soares[2], and J. R. Pereira da Silva[2]

Stellar rotation has its origin in stellar formation, when the angular momentum of the parent cloud is transferred to the newer stars. The equatorial rotation V can be calculated from the radius and rotation periods by $V = 2\pi R/P$. The mean $\langle \sin i \rangle$, since i is the inclination angle between the stellar rotation axe and the line of sight, of a sample of observational data is estimated from the ratio between the mean of the projected velocity $\langle V \sin i \rangle$ and the mean of the equatorial rotation $\langle V \rangle$. In the literature, the mean inclination angle always adopts a value of $\pi/4$ independent of the particularities of the stellar population or the data sample under study. Such a procedure not infrequently leads to divergences between theoretical models and observed data. The present work intends to find out the real mean inclination angle for a set of stars in Pleiades cluster.

This work fits the distribution function of the true rotation of a sample of Pleiades stars with the generalized distribution function, named q-Maxwellian function. Also we determine the q value by fitting the projected rotational velocity distribution of those stars. Finally the q values obtained from the fitting procedures are used to estimate the mean $\langle \sin i \rangle$ for such Pleiades sample producing a good result when compared to mean values from the observational data.

[1] IFMA.
[2] UERN.

ON THE LOCAL DARK MATTER DENSITY

C. Moni Bidin[1], R. Smith[2], G. Carraro[3,4], R. A. Méndez[5], and M. Moyano[1]

Moni Bidin et al. (2012, ApJ, 751, 30, hereafter MB12) has recently proposed a new formulation to calculate the dynamical mass density enclosed in a large volume of the Galaxy, by means of the three-dimensional kinematics of a test stellar population. Applying this formulation to three kinematical data sets available in the literature, they surprisingly found a lack of dark matter at the Solar position. Bovy & Tremaine (2012, ApJ, 756, 89, hereafter BT12) argued that MB12 calculation is flawed by a wrong assumption, and that a corrected one-dimensional formulation recovers the expected amount of dark matter. In this contribution, we show that BT12 formulation is based on an assumption ruled out by all observational evidence, that causes a strong overestimate of the mass density. Moreover, we show that the MB12 assumption criticized by BT12 has negligible effects on the results, hence their criticisms is not the solution to the puzzling results found by MB12.

[1] Instituto de Astronomía, Universidad Católica del Norte, Av. Angamos 0610, Antofagasta, Chile (cmoni@ucn.cl).
[2] Departamento de Astronomía, Universidad de Concepción, Casilla 160-C, Concepción, Chile.
[3] European Southern Observatory, Alonso de Cordova 3107, Vitacura, Santiago, Chile.
[4] Universitá di Padova, Dipartimento di Fisica e Astronomia, Vicolo Osservatorio 3, I-35122, Padova, Italia.
[5] Departamento de Astronomía, Universidad de Chile, Casilla 36-D, Santiago, Chile.

SUPERNOVA REMNANTS COLLIDING WITH MOLECULAR CLOUDS: FROM HIGH- TO LOW-ENERGY INTERACTIONS

T. Montmerle[1]

It is now well established that a class of gamma-ray sources in the galactic plane, especially in the TeV range as seen by HESS and other Cerenkov telescopes, and in the GeV range by the Fermi and AGILE satellites, is associated with intermediate-age supernova remnants interacting with molecular clouds in massive star-forming regions. After a brief general introduction linking high-energy gamma-rays and cosmic rays, I will focus on a few such gamma-ray sources (W28, W44, and W51) and the challenging conclusions that can be drawn from them. I will then describe our recent work on related submm measurements and implications of enhanced ionizing effects in molecular clouds due to locally accelerated low-energy cosmic rays.

[1] Institut d'Astrophysique de Paris, France.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

NEAR-IR PERIOD-LUMINOSITY RELATIONS FOR VARIABLE STARS IN ω CENTAURI

C. Navarrete[1,2], M. Catelan[1,2], R. Contreras Ramos[1,2], F. Gran[1,2], J. Alonso-García[1,2], and I. Dékány[1,2]

We report on an extensive time-series study of the globular cluster ω Centauri (NGC 5139), obtained in the framework of the VVV Templates project (Catelan et al. 2013, arXiv: 1310.1996). This cluster was chosen for this project due to its large variable star content. A total of 42 and 100 epochs of the cluster in J and K_S, respectively, were taken using VIRCAM@VISTA, and PSF photometry was performed to derive light curves for 270 pulsating stars (RRab, RRc, type II Cepheids and SX Phoenicis) with an unprecedented phase coverage in the near-IR. Period-Luminosity (PL) relations in both bands were derived using Fourier fitted magnitudes for RR Lyrae and Type II Cepheids, while weighted-average magnitudes were used for SX Phe stars. Using the PL relation for RRab stars derived by Dékány et al. (2013, ApJ, 776, 19L) in the VISTA K_S system, we determine a distance modulus of $(m - M)_0 = 13.78 \pm 0.04$ mag, in good agreement with Del Principe et al. (2006, ApJ, 652, 362). From Type II Cepheids we derived a value of $(m - M)_0 = 13.67 \pm 0.07$ mag, similar to what was found by Matsunaga et al. (2006, MNRAS, 370, 1979). For SX Phe stars, we use the derived periods and magnitudes to infer their pulsation modes, and we confirm that at least 12 of them are fundamental-mode pulsators (Olech et al. 2005, MNRAS, 363, 40).

[1] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile (cnavarre@astro.puc.cl).
[2] The Milky Way Millennium Nucleus.

HIGH-IONIZATION ACCRETION SIGNATURES IN COMPACT BINARY CANDIDATES FROM SOAR TELESCOPE OBSERVATIONS

A. S. Oliveira[1], C. V. Rodrigues[2], D. Cieslinski[2], F. J. Jablonski[2], K. M. G. Silva[1,2], and L. A. Almeida[2]

The increasing number of synoptic surveys made by small robotic telescopes, like the photometric Catalina Real-Time Transient Survey (CRTS – Drake et al., 2009, ApJ, 696, 870), represents a unique opportunity for the discovery of new variable objects and also to improve the samples of many classes of variables. Our goal in this work was the discovery of new polars, a subclass of magnetic Cataclysmic Variables (mCVs) with no accretion disk, and Close Binary Supersoft X-ray Sources (CBSS), strong candidates to Type Ia Supernova progenitors. Both are rare objects and probe interesting accretion scenarios. Finding spectral features associated to high-ionization mass accretion constrains the CBSS or magnetic CV nature for the candidates, expanding the hitherto small samples of these classes (specially CBSS) and allowing for detailed observational follow-up. We used the Goodman Spectrograph on SOAR 4.1 m Telescope to search for signatures of high-ionization mass accretion, as He II 468,6 nm emission line and inverted Balmer decrement, on 39 variable objects selected mostly from CRTS. In this sample we found 14 strong candidates to mCVs, 1 Nova in the final stages of eruption, 14 candidates to Dwarf Novae, 5 extragalactic sources (AGN), 1 object previously identified as a Black Hole Nova, 3 objects with pure absorption spectral features and 1 unidentified object with low S/N ratio. The mCVs candidates found in this work will be studied using time-resolved spectroscopic, polarimetric, and photometric observations in a follow-up project.

[1] IP&D-UNIVAP, Av. Shishima Hifumi, 2911, São José dos Campos, Brazil (alexandre@univap.br).
[2] DAS-INPE/MCTI, Av. dos Astronautas, 1758, São José dos Campos, Brazil.

OPEN CLUSTER DETECTION IN EXTENSIVE SKY REGIONS USING ASTROMETRIC PARAMETERS

L. G. Paíz[1], M. S. De Biasi[1], and R. B. Orellana[1]

We developed a non-parametric method for identifying open clusters in large areas of the sky using stellar position and proper motions. Two binary codes were established from the analysis of the empirical probability density functions in position and proper motion, after eliminating field stars contamination. For each star, these codes provided a parameter indicating the star belongingness to spatial and proper motion overdensities. The method was tested in a region of $4^\circ \times 5^\circ$ where Collinder 140 and Collinder 132 are located. 1300 stars up to the magnitude R=11 were obtained from UCAC2 and its supplement UCAC2 BSS catalogue. We detected six stellar groups having spatial and proper motion overdensities. A detailed analysis revealed that three of them could be open clusters. We confirmed that one of them is Collinder 140, for

which mean coordinates ($\bar{\alpha}$,$\bar{\delta}$)=(110.8°,-32.0°), a radius of about 12' and mean proper motion components ($\bar{\mu}_\alpha cos\delta$,$\bar{\mu}_\delta$)=(9,4) mas/yr were obtained, in good agreement with the literature. The other two possible clusters have members fainter than magnitude 10.0 and they are not found in the literature. Related to Collinder 132, the low density of the data used in the area did not allow to detect it.

[1] Facultad de Ciencias Astronómicas y Geofísicas, UNLP, Paseo del Bosque s/n, 1900, La Plata, Argentina.

ΔA OBSERVATIONS OF THREE GLOBULAR CLUSTERS: NGC 104, NGC 6205, AND NGC 7099

E. Paunzen[1,2], I. K. Illiev[2], and O. I. Pintado[3]

Globular clusters are main astrophysical laboratories to test and modify evolutionary models. Thought to be rather homogeneous in their local elemental distribution of members, new results suggest a wide variety of chemical peculiarities. The preselection of apparent peculiar stars for a detailed spectroscopic analysis is very important for globular cluster fields. Most regions are very dense and the target stars are, normally, very faint. Photometry could be one way out of the dilemma since it is very efficient. Up to now, only observations in the Johnson $UBV(RI)$ and Strömgren $uvby\beta$ systems are able The tool of Δa photometry is employed in order to detect chemically peculiar Population II stars. This three filter narrow band system measures the flux distribution in the region from 4900 to 5600Å in order to find any peculiarities around 5200Å. The first Δa observations for 3 globular clusters: NGC 104, NGC 6205 and NGC 7099, give very promising results, which will serve as a solid basis for follow-up observations including photometric as well as spectroscopic studies.

[1] Department of Theoretical Physics and Astrophysics, Masaryk University, Brno, Czech Republic.
[2] Rozhen National Astronomical Observatory, Institute of Astronomy of the Bulgarian Academy of Sciences, Smolyan, Bulgaria.
[3] Instituto Superior de Correlación Geológica, Tucumán, Argentina.

GALACTIC EMBEDDED CLUSTERS WITH 2MASS INFRARED PHOTOMETRY

D. B. Pavani[1], P. P. De Araujo[1], E. Bica[1], and C. Bonatto[1]

Star clusters and associations are born in general embedded within giant molecular clouds. Because of this, during their formation and early evolution they are often only visible at infrared wavelengths, being heavily obscured by dust. In this work we employed the 2MASS photometric database together with WISE (NASA) images to analyze, for the first time, 10 Galactic embedded cluster candidates. WISE is fundamental owing to its sensitivity to dust emission, especially in the 12 μm and 22 μm bands. We followed the revised list of Dolidze clusters by M. Kronberger which was communicated to the DAML02 database (Dias et al. 2002). We selected interesting Dolidze objects from this list with additional inspections by one of us (E. B.). In the present study we show results for 4 candidates in view of determining their astrophysical parameters. We produced colour-magnitude diagrams (CMDs) and radial density profiles (RDPs). We employed the field decontamination method by Bonatto & Bica (2007, 2010) to obtain clean CMDs. We fit isochrones from PARSEC models (Bressan et al. 2012). This method has been systematically used in our publications and have shown how effective it is. All objects present a central concentration and extensions in RDPs. In certain cases, e.g. Dolidze 25, the profile distribution and central density are significant. The RDPs were important to define the extraction regions for the objects and their field decontamination areas. The isochrone fittings for Dolidze 5 show a clear Main Sequence (MS), while for Dolidze 25 a MS and Pre Main Sequence (PMS) are present. Dolidze 5 and Dolidze 25 appear to be physical systems, considering only the photometric data, while Dolidze 47 and Dolidze 55 resulted as field fluctuation.

[1] Department of Astronomy, Physics Institute, UFRGS, Brazil.

GALACTIC DYNAMICS: ORIGIN, HISTORY, PRESENT AND PROSPECT

B. Pichardo[1]

I present a travel through the history and main contributions to astrophysical development of the galac-

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

tic dynamics discipline, passing by the most successful predictions and models, finishing with an integral vision of what is known from the Milky Way structure from it dynamics and the prospects with the new large scale surveys to understand it in the next decades.

[1] Instituto de Astronomía, Universidad Nacional Autónoma de México (UNAM).

USING MASSCLEAN TO DESCRIBE STELLAR CLUSTERS FOUND IN THE VISTA VARIABLES IN THE VIA LACTEA (VVV) SURVEY

B. Popescu[1], M. M. Hanson[1], J. Borissova[2], R. Kurtev[2], V. D. Ivanov[3], M. Catelan[4], S. S. Larsen[5], D. Minniti[4], and P. Lucas[6]

The important parameters: age, mass and distance of resolved or partially resolved stellar clusters are better accurately determined by using color-magnitude diagrams (CMD). However, when the main sequence turnoff is not available or clearly identifiable, large errors in all parameters result when using simple isochrone fitting, particularly when observations are limited to near-infrared bands. We used the MASSCLEAN package to perform 5 million Monte Carlo simulations of stochastically sampled stellar clusters in order to generate CMD templates for a variety of cluster masses and ages and which mimic the observational photometric errors. This results in the creation of tens of thousands of n-dimensional stellar density maps (templates) in numerous color planes as a function of age and mass. We use these MASSCLEAN CMD templates to refine and sharpen traditional isochrone fitting to analyze the newly discovered stellar clusters/cluster candidates from the Vista Variables in the Via Lactea (VVV) Survey. Our MASSCLEAN templates are also being used to design and optimize search algorithms for stellar clusters in broad-band surveys.

[1] Department of Physics, University of Cincinnati, PO Box 210011, Cincinnati, OH 45221-0011, USA (bogdan.popescu @uc.edu, margaret.hanson@uc.edu).
[2] Departamento de Física y Astronomía, Facultad de Ciencias, Universidad de Valparaíso, Ave. Gran Bretaña 1111, Playa Ancha, Valparaíso, Chile.
[3] European Southern Observatory, Ave. Alonso de Cordoba 3107, Casilla 19001, Santiago, Chile.
[4] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, Casilla 306, Santiago 22, Chile.
[5] Department of Astrophysics/ IMAPP, Radboud University Nijmegen, PO Box 9010, 6500 GL Nijmegen, The Netherlands.
[6] Centre for Astrophysics Research, Science and Technology Research Inst., University of Hertfordshire, Hatfield, AL10 9AB, UK.

MASS EXTINCTIONS, GALACTIC ORBITS IN THE SOLAR NEIGHBORHOOD AND THE SUN: A CONNECTION?

G. F. Porto de Mello[1], W. S. Dias[2], J. Lépine[3], D. Lorenzo-Oliveira[1], and R. K. Siqueira[4]

The orbits of the stars in the disk of the Galaxy, and their passages through the Galactic spiral arms, are a rarely mentioned factor of biosphere stability which might be important for long-term planetary climate evolution, with a possible bearing on mass extinctions. The Sun lies very near the co-rotation radius, where stars revolve around the Galaxy in the same period as the density wave perturbations of the spiral arms. Conventional wisdom generally considers that this status makes for few passages through the spiral arms. Controversy still surrounds whether time spent inside or around spiral arms is dangerous to biospheres and conducive to mass extinctions. Possible threats include giant molecular clouds disturbing the Oort comet cloud and provoking heavy bombardment; a higher exposure to cosmic rays near star forming regions triggering increased cloudiness in Earth's atmosphere and ice ages; and the destruction of Earth's ozone layer posed by supernova explosions. We present detailed calculations of the history of spiral arm passages for all 212 solar-type stars nearer than 20 parsecs, including the total time spent inside the spiral arms in the last 500 Myr, when the spiral arm position can be traced with good accuracy. We found that there is a large diversity of stellar orbits in the solar neighborhood, and the time fraction spent inside spiral arms can vary from a few percent to nearly half the time. The Sun, despite its proximity to the galactic co-rotation radius, has exceptionally low eccentricity and a low vertical velocity component, and therefore spends 30% of its lifetime crossing the spiral arms, more than most nearby stars. We discuss the possible implications of this fact to the long-term habitability of the Earth, and possible correlations of the Sun's passage through the spiral arms with the five great mass extinctions of the Earth's biosphere from the Late Ordovician to the Cretaceous-Tertiary.

[1] Observatório do Valongo, Universidade Federal do Rio de Janeiro.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

[2] Instituto de Ciências Exatas, Universidade Federal de Itajubá.
[3] Instituto Astronômico, Geofísico e de Ciências Atmosféricas, Universidade de São Paulo.
[4] Instituto Carlos Chagas Filho de Biofísica, Universidade Federal do Rio de Janeiro.

A CONTINUED SEARCH FOR CEMP RR LYRAE STARS

H. M. Reggiani[1], C. R. Kennedy[2], S. Rossi[1], and T. C. Beers[3]

Among the stellar populations of the Galactic halo there is a class of stars known as carbon-enhanced metal-poor (CEMP) stars. These are metal-poor ($[Fe/H] < 1.0$) stars whose atmospheres exhibit large overabundances of carbon ($[C/Fe] \geq +0.7$). The frequency of these stars increases with decreasing metallicity, and so by studying their abundance patterns, one can begin to uncover details of the origins of the elements. There exist a number of different classes of CEMP stars (Beers & Christlieb 2005) with specific abundance characteristics; one of them is the CEMP-s class, which exhibit evidence of s-process element enrichment, widely believed to be resultant of mass transfer from a companion low-metallicity asymptotic giant branch (AGB) star, where the production of carbon and s-process elements occurs. Recent spectroscopic observations of metal-poor RR Lyrae stars have revealed that their typical abundance patterns are consistent with very metal-poor (VMP) and extremely metal-poor (EMP) giants and dwarfs studied in the halo system of the Milky Way. Of particular interest is the recent discovery of a VMP RR Lyrae that has large overabundances of carbon and the s-process elements. In this work, we showed results obtained with WiFeS observations 2.3m Siding Spring Observatory telescope of a set of newly-identified CEMP stars that are known RR Lyr stars. We confirmed theses stars as CEMP stars (Kennedy et. al., in prep) and will, eventually, test their abundances against new stellar evolution simulations of CEMP stars.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo.
[2] Research School of Astronomy & Astrophysics, Australian National University.
[3] National Optical Astronomy Observatory.

TOWARDS THE DEVELOPMENT OF A SEMIAUTOMATIC PIPELINE FOR INVESTIGATING THE VISCOSITY PARAMETER OF DISKS OF BE STARS BY THE ANALYSIS OF LIGHT CURVES

L. R. Rímulo[1], A. C. Carciofi[1], X. Haubois[2], and T. Rivinius[3]

In "Viscous Decretion Disk" (VDD) model for circumstellar disks Be stars, material is dynamically ejected near the equator of the star and diffuses outwards by means of viscous forces. Following the α-disk approach for the VDD, we show that dynamical disk models coupled with the radiative transfer code `HDUST` can be used for constraining fundamental disk parameters, such as the α viscosity parameter, the base density, the orientation angle i of the disk and the mass injection rate, only through the analysis of two-color light curves of Be stars that cover a few years and show "bump-like" magnitude excesses. The form of the bump depends on the dynamical state of the disk during the whole process of construction and dissipation. We show that the state of the disk can be extracted from two-color light curves by fitting theoretical curves, derived from a grid of dynamical models that we computed, to the observed light curves. The α viscosity parameter works as a time scaling parameter, and is also obtained in the process of fitting, for each Be star.

[1] Departamento de Astronomia, Universidade de São Paulo, Rua do Matão, 1226 - Cidade Universitária, São Paulo-SP - Brazil - 05508-090.
[2] Observatoire de Paris /LESIA, 5 place Jules Janssen, 92190 Meudon, France.
[3] ESO, Alonso de Cordova, 3107 - Vitacura, Santiago de Chile - Chile.

PROBING ACCRETION ON THE HIGH-MAGNETIZED POLAR RX J1007.5-2017

C. V. Rodrigues[1], D. Cieslinski[1], T. Ribeiro[2], K. M. G. Silva[3], R. Baptista[4], A. S. Oliveira[3], J. E. R. Costa[1], and R. Campbell[5]

RX J1007.5-2017 is a polar: a compact binary system in which matter flows from a low-mass main-sequence star to a magnetized white dwarf without the formation of an accretion disk. RX J1007.5-2017 has some observational peculiarities (conspicuous optical cyclotron harmonics, a very soft X-ray spectrum, and no polarization in R and I bands), which may be related to extreme conditions at the accretion flow: a very strong white-dwarf magnetic

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

field (around 100 MG on surface) and a low accretion rate. To study the accretion, from the mass-donor star to the white dwarf, we obtained time-resolved spectroscopy using the Goodman spectrograph at the SOAR telescope in observing runs distributed around the first semester of 2012. We found the object in different brightness states. In the low state, we gathered data with two spectral resolutions (219 km/s and 170 km/s). In a brighter state, the spectral resolution was ≈170km/s. The low (high) spectral resolution data cover the spectral region from 360 to 760 nm (435 to 700 nm). The continuum varies in both states and the cyclotron humps are visible at some orbital phases. The low-state spectra show Balmer emission lines superimposed on absorption features from the mass-donor star. The bright-state spectra show strong Balmer, HeI, and HeII emission lines. The Balmer and HeII lines are not single Gaussians: in bright state the lines are broader and have three components; in low state, the lines are narrower and two components are distinguished in some phases. Doppler tomography of the low state reveals that line emission arises mainly from a region near the white dwarf. The orbital dependence of the cyclotron emission was modeled using the Cyclops code, which adopts a 3D representation of the accretion column.

[1] Divisão de Astrofísica, Instituto Nacional de Pesquisas Espaciais, Brazil (claudia.rodrigues@inpe.br).
[2] Universidade Federal de Sergipe, Brazil.
[3] Universidade do Vale do Paraíba, Brazil.
[4] Universidade Federal de Santa Catarina, Brazil.
[5] Humboldt State University, USA.

HIGH-RESOLUTION SPECTROSCOPIC OF RED GIANTS STARS IN NGC 2360

J. V. Sales Silva[1] and C. B. Pereira[1]

Open clusters are excellent laboratories to test our knowledge of the formation and evolution of the two components of the disk (thick and thin disk), and stellar structure and evolution, since the stars present the same age and distance reducing the uncertainties associated with field stars of the Galaxy. NGC 2360 is an open cluster with 0.85 Gyr, with galactocentric distance equal to 9.28 Kpc and height equal to −30 pc. We determine to 15 stars in the NGC 2360 using high resolution spectroscopy the atmospheric parameters and the chemical composition for Fe, Ni, Cr, Ca, Mg, Si, Ti, Na, Al, Ba, Y, Zr, La, Ce and Nd with measures of equivalent widths of absorption lines, and spectral synthesis for C, O and N. The spectra of 14 stars were obtained with FEROS at the 2.2m ESO telescopes at La Silla (Chile). Only one star was observed with UVES/VLT at Paranal Observatory. Atmospheric parameters and abundances were determined using the LTE atmosphere models of Kurucz and the spectral analysis code MOOG. The abundance of alpha and iron-peak elements of NGC 2360 are typical disk abundances. We also observed a slight overabundance of the elements generated by the s-process in NGC 2360 with respect to field stars of the disk. The overabundance of the elements generated by the s-process occurs in young open clusters and may be linked to high-efficiency of these nucleosynthesis in low-mass stars ($< 1.5 M_{\odot}$). However, this high-efficiency has not been explained by the stellar evolutionary models. Additional observations and high resolution spectroscopic analysis of intermediate-age open clusters (like NGC 2360) are necessary to confirm the slight overabundances of s-process elements with relation to field stars of the disk and old open clusters.

[1] Observatório Nacional, Rua José Cristino, 77. 20921-400, São Cristóvão, Rio de Janeiro-RJ, Brazil (joaovictor, claudio@on.br).

DISCRIMINATING LOCAL GROUP EMBEDDED STAR CLUSTERS FROM OLDER ONES USING NEAR-IR PHOTOMETRIC INDEXES

J. F. C. Santos Jr.[1], H. Dottori[2], and P. Grosbøl[3]

Several grand-design spiral galaxies show a bimodal distribution of their system of star clusters and star forming complexes in JHK diagrams. The $(J-H)$ vs $(H-Ks)$ diagram revealed that embedded clusters, still immersed in their parental clouds of gas and dust, have in general a redder $(H-Ks)$ colour than older clusters, whose gas and dust have already been ejected. In addition, the reddening-free index $Q_d = (H-K_s)$ - 0.884 $(J-H)$ was shown to correlate with age for the young clusters and thus provided an effective way to differentiate the embedded clusters from the older ones. In the present work, the aforementioned photometric indices were explored for star cluster systems in the Local Group. In particular, we investigate the effectiveness of the Q_d index in sorting out clusters of different ages at their early evolutionary stages. Surface photometry

on 2MASS images was carried out for populous clusters younger than approximately 100 Myr and whose ages are available. The integrated magnitudes and colors extracted from the surface photometry showed the same bimodal distribution in JHK diagrams as that found for more distant galaxies, suggesting that the phenomenon is universal. We confirm the index Q_d as a powerful tool to distinguish clusters younger than about 7 Myr from older clusters.

[1] Instituto de Ciências Exatas, Universidade Federal de Minas Gerais, Av. Antônio Carlos 6627, 31270-901 Belo Horizonte, MG, Brazil (jsantos@fisica.ufmg.br).
[2] Instituto de Física, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves 9500, 91501-970 Porto Alegre, RS, Brazil (dottori@ufrgs.br).
[3] European Southern Observatory, Karl-Scharzschild-Str. 2, 85478 Garching, Germany (pgrosbol@eso.org).

MAPPING OF THE PHYSICOCHEMICAL CONDITIONS OF THE PLANETARY NEBULA MENZEL 1

P. Santos[1] and H. Monteiro[1]

We prensent a study of the physicochemical conditions of the planetary nebula Menzel 1 using the method of spatially resolved spectrophotometric mapping. The data used in this study were collected in the Cerro Tololo Inter-American Observatory (CTIO) 0.9 m telescope. Observations were made with traditional long-slit spectroscopy with exposures taken for multiple parallel positions along the object in order to map it. The separation of the 4" slits were of 4". Initially, a data cube was created with the spectra obtained for each position of the slit. We used MPFIT - a software package that aims to find parameters that best fit the data to a function - to fit gaussians to the emission lines observed in each pixel of the spatial direction, for each slit in the data cube. We then reconstructed the image of the nebula for each a given emission line extracted from the data cube, interpolating between observed slit positions. With these maps, we obtained the interstellar extinction from the $H\alpha/H\beta$ ratio pixel by pixel. We obtained the density map from the [SII]671.7nm/673.1nm ratio and the temperature map from the [NII](654.8+658.4)nm/575.5nm ratio. Using the code NEAT (Nebular Empirical Analysis Tool), the maps of the chemical abundance were calculated from the flux maps. These maps provide a spatially resolved overview of the physicochemical conditions found in this object. From the maps, we calculated mean values for the main diagnostics, which compared well with values from the literature, showing that we retrieved results from observations without spatial resolution. This method allows the study of planetary nebulae in more detail than conventional methods.

[1] Instituto de Física e Química, Universidade Federal de Itajubá (psantos.phyas@gmail.com; hektor.monteiro@gmail.com).

MODELING BLUE HORIZONTAL BRANCH STARS

R. G. Santos[1] and L. P. Martins[1]

The stars of the Blue Horizontal Branch (BHB) are characterized by having being through most of their evolutionary process and lost part of their external layers, leaving only a thin layer of hydrogen and a burning Helium nucleus. This makes these stars very blue and hot, although old. They are present in many stellar population systems (e.g. stellar clusters and elliptical galaxies), and their presence can induce errors in the age determination of these objects using integrated spectra. The stellar population analysis technique using integrated spectra is a very powerful tool nowadays, however stellar population models do not account for the BHB stars. Because of that, the presence of these stars induces to the determination of younger ages than expected for these systems. In this project we will create synthetic spectra for the BHB stars that can be incorporated to the stellar population models to be used in spectral synthesis. Here we present a study of the atmospheric parameters of these stars that will be used to create the synthetic spectra.

[1] Núcleo de Astrofísica Teórica, Universidade Cruzeiro do Sul, Campus Liberdade, Rua Galvão Bueno, 868, Liberdade, São Paulo, Brasil (rafaboner@terra.com.br).

ACCRETION DISC MAPPING OF THE SHORTEST PERIOD ECLIPSING BINARY SDSS J0926+36

W. Schlindwein[1] and R. Baptista[1]

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

AM CVn stars are ultracompact binaries ($P_{orb} <$ 65 min) where a hydrogen-deficient low-mass, degenerate donor star overfills its Roche lobe and transfers matter to a companion white dwarf via an accretion disc. SDSS J0926+36 is currently the only eclipsing AM CVn star and also the shortest period eclipsing binary known. Its light curve displays deep ($\sim$ 2 mag) eclipses every 28.3 min, which last for $\sim$ 2 min, as well as $\sim$ 2 mag amplitude outbursts every $\sim 100 - 200$ d. Superhumps were seen in its quiescent light curve in some occasions, probably as a reminiscence of a (in some cases undetected) previous outburst. Its eclipsing nature allows a unique opportunity to disentangle the emission from several different light sources, and to map the surface brightness distribution of its hydrogen-deficient accretion disc with the aid of maximum entropy eclipse mapping techniques. Here we report the eclipse mapping analysis of optical light curves of SDSS J0926+36, collected with the 2.4 m Liverpool Robotic Telescope, covering 20 orbits of the binary over 5 nights of observations between 2012 February and March. The object was in quiescence at all runs. Our data show no evidence of superhumps nor of orbital modulation due to anisotropic emission from a bright spot at disc rim. Accordingly, the average out-of-eclipse flux level is consistent with that of the superhump-subtracted previous light curves. We combined all runs to obtain an orbital light curve of improved S/N. The corresponding eclipse map shows a compact source at disc centre ($T_b \simeq 17000\,K$), a faint, cool accretion disc ($\sim 4000\,K$) plus enhanced emission along the gas stream ($\sim 6000\,K$) beyond the impact point at the outer disc rim, suggesting the occurrence of gas stream overflow at that epoch.

[1] Departamento de Física, Universidade Federal de Santa Catarina, Campus Trindade, 88040-900, Florianópolis-SC, Brasil (wagner.schlindwein@astro.ufsc.br, raybap@gmail.com).

ALS 2883: ANALYSIS OF SPECTROSCOPIC FEATURES

A. R. Silva[1], R. S. Levenhagen[2], R. Künzel[2], and N. V. Leister[3]

ALS 2883 (RA $13^h02^m47^s$, DEC $-63^o50'08''$, M_v 10.1) is the first known radio pulsar with an emission B-type companion system, discovered in 1992. The Be companion of ALS 2883 has all line profiles in the visible range in emission. This emission is a common hallmark among many Be stars, and this effect is thought to be due to the presence of a circumstellar environment. Also, the star is orbiting a X-ray source as has been detected by the XMM-Newton Science Operation Center. In this study, we present the observations of ALS 2883 made at the OPD/LNA 1.60 m telescope with the Coudé spectrograph in the range 4000 to 5000 Å and S/N $\simeq$ 200, performed in April 2011. First-order estimations of T_{eff} and log g parameters have been performed through Johnson's UBV and JHK photometric calibrations. Projected rotation velocity V sin i has been estimated through the mean of the first zeroes of the Fourier transforms of neutral helium rotation profiles adopting linear, quadratic and square-root limb-darkening laws. The physical conditions of the circumstellar envelope were estimated through the solution of the radiative transport equation assuming local thermodynamic equilibrium within a disk-shaped circumstellar environment with a Keplerian velocity field. The radiative transport equation is solved assuming the Roche model as a boundary condition in the circumstellar environment. Iterating the computations with a downhill-simplex algorithm, this analysis leads to a best solution for an envelope with T $\simeq$ 9500 K, gas density $\rho \simeq 2 \times 10^{-15} g.cm^{-3}$, internal radius $r_i \simeq 8\ R_\odot$ and external radius $r_e \simeq 30\ R_\odot$, rotating with $V_{rot} \simeq 140$ km.s^{-1} and expanding with $V_{exp} \simeq 90$ km.s^{-1}.

[1] UNIFESP - Universidade Federal de São Paulo, Campus Diadema, Departmento de Ciências Exatas e da Terra. (andre.rodrigo@unifesp.br).
[2] UNIFESP - Universidade Federal de São Paulo, Campus Diadema, Departmento de Ciências Exatas e da Terra.
[3] IAG-USP.

TIME-DEPENDENT NONEXTENSIVITY ARISING FROM THE STELLAR ROTATION

J. R. P. Silva[1], M. M. F. Nepomuceno[1], B. B. Soares[1], and D. B. de Freitas[2]

In nonextensive formalism (NF) the index q can be interpreted as a parameter of long-memory. When $q \to 1$ the system becomes extensive and the memory effects are negligible. We found that for solar-type stars in open clusters the index q of the distribution of $V \sin i$ decreases with the cluster age. The extensivity of the distributions ($q = 1$) is not present until about an age range of $100 - 700$Myr. A possible explanation for the anti-correlation can be the

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

memory of the initial stellar angular momentum vanishing, considering q as a memory parameter ($q = 1$ corresponding to no memory). In fact, these stars retain the memory of their initial angular momentum until an age > 100 Myr (e.g., Bouvier et al. 1997, A&A, 326, 1023). de Freitas & De Medeiros (2013, MNRAS, 433, 1789) shown that the rotation-age relationship can be reproduced using a model from NF. In this model the index q_K is derived from the Kawalers parameterization, where $q_K = 1$ indicates the saturated magnetic field regime, and the unsaturated one is given by $q_K = 1 + 4aN/3$. The parameters a and N are related to the dynamo and magnetic field geometry, respectively. We used the de Freitas & De Medeiros' model to derive an empirical relationship between q, a and N as the equation $q \approx q_0(1 - \Delta t/q_K)$, where $\Delta t = t - t_0$ is the age range, and q_0 is the index$q$ for the cluster with age t_0. This equation constitutes a bridge between q and the theory of magnetic braking of stellar rotation.

[1] Universidade do Estado do Rio Grande do Norte, Brazil.
[2] Universidade Federal do Rio Grande do Norte, Brazil.

ZINC ABUNDANCES IN GALACTIC BULGE STARS

C. R. Silveira[1] and B. Barbuy[1]

Zinc is overabundant in metal-poor stars (Cayrel et al. 2004), being partially produced by neutron addition. It decreases with increasing metallicity, similarly to alpha-elements. In order to trace its abundance, the derivation of Zn abundance in different stellar populations, and varying metallicities, helps understanding its nucleosynthesis processes.

Zn is also the main element of reference to derive the metallicity from absorption lines in quasars (QSOs), which allows to compare their evolution as a function of redshift and metallicity in metal-poor stars.

In the present work, we derive Zn abundances for a sample of 56 bulge field stars, observed at high resolution with the FLAMES-UVES spectrograph. The mean wavelength coverage is 4800-6800 Å, at a resolution R $\sim$ 45000. The atmospheric parameters effective temperature, gravity and metallicity were derived in Zoccali et al. (2008) and Hill et al. (2011). Recently we have analysed the manganese abundances of this sample (Barbuy et al. 2013).

To compute the Zn abundances we use spectrum synthesis, for the lines ZnI 4810.53 and 6362.34 Å. The analysis of our data shows that the abundance of [Zn/Fe] decreases with increasing metallicity, in agreement with the data obtained from the literature. The details of Zn behaviour for the metal-rich bulge stars of the present work are under analysis.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Departamento de Astronomia, Universidade de São Paulo.

A STUDY OF ROTATIONAL VELOCITY DISTRIBUTION OF BE STARS

C. Sitko[1], E. Janot-Pacheco[2], and M. Emilio[1,3,4]

Classical Be stars are rapid rotators of spectral type late O to early A and luminosity class V-III, which exhibit Balmer emission lines and often a near infrared excess originating in an equatorially concentrated circumstellar envelope, both produced by sporadic mass ejection episodes. The causes of the abnormal mass loss (the so-called Be phenomenon) are as yet unknown. In spite of their high $v \sin i$, rapid rotation alone cannot explain the ejection episodes as most Be stars do not rotate at their critical rotation rates. In this work we present the distribution of $v \sin i$ of 261 Be's stars from BeSS (Be Star Spectra) database. We used two techniques, the Fourier method and the FWHM (Full Width at Half Maximum) method. For the analysis we made use of three absorption lines of Helium (4026Å, 4388Å and 4471Å). Stars with projected rotational velocities up to 300 kms^{-1} agree with the ones already published in the literature. 84 of our stars do not have the values of rotational velocity published. The majority of our sample are B1/B2 spectral type, whose have the greatest velocities.

[1] Universidade Estadual de Londrina.
[2] Instituto de Astronomia, Geofísica e Ciências Atmosféricas - Universidade de São Paulo.
[3] Universidade Estadual de Ponta Grossa.
[4] Institute for Astronomy - University of Hawaii.

MORE FITTING $V \sin I$ DISTRIBUTION FOR EVOLVED FIELD STARS

B. B. Soares[1], J. R. P. Silva[1], M. P. Silva[1], and V. A. França[1]

We use 1536 $V \sin i$ measurements of evolved field stars in order to determine the q parameter from

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

the named q-Maxwellian model (Soares *et al.* 2006, Physica A, 364, 413), a power-law type distribution function that adjusts the distribution of the projected rotational velocity. Then we compare the different distributions of $V \sin i$ obtained for different $B-V$ intervals with the distribution model using the Kolmogorov-Smirnov statistical test to find the best fit.

Results revealed that, as overall trend, low $B-V$ tends to exhibit $q > 1$ values while $q < 1$ for high $B-V$ for all classes of stars under study. Specifically, this point indicates rotation distributions with long tails due to the percentage of stars with relatively high speed for low $B-V$, and tailless distributions for stars of high $B-V$. Furthermore, it is a general behavior that binaries present q values slightly higher than singles indicating that their rotation distributions are wider than the single ones. As another broad trend, binaries tend to have $q < 1$ values later than their fellow-colors. In addition, there exists an inversion point in $B-V$, from which $q > 1$ regime switches to $q < 1$ regime, that is higher the more evolved is the luminosity class.

[1] Departamento de Física, Universidade do Estado do Rio Grande do Norte, Mossoró–RN, Brazil (Email to: brauliosoares@uern.br).

SN 2009N: ANOTHER SUPERNOVA BETWEEN THE NORMAL AND SUBLUMINOUS TYPE II-P SNE

K. Takáts[1]

We collected ultraviolet, optical, and near-infrared photometry together with optical and near-infrared spectra of SN 2009N. The optical spectra had narrow features with low velocities, typical of subluminous SNe II-P. The bolometric luminosity during the plateau phase was in between those of the subluminous and normal SNe II-P.

The NIR spectra of SN 2009N contain features typical of SNe II-P, with the exception of the appearance of a feature at $\sim 1.055\,\mu$m +48 days after the explosion. Via spectral modeling we found that this line is probably due to high-velocity He I λ10830 The presence of this line, together with a HV component of Hα, can be an indicator of weak interaction of the ejecta with circumstellar material.

We estimated the distance to SN 2009N using multiple versions of both the expanding photosphere method and the standardized candle method as $D = 21.6 \pm 1.1$ Mpc ($\mu = 31.67 \pm 0.11$). The produced nickel mass was estimated to be 0.020 ± 0.004 M$_\odot$. We determined the physical properties of the progenitor at the explosion via hydrodynamical modeling. The total explosion energy ($\sim$ 0.48 foe) is in between the values typical of subluminous and normal SNe II-P. The pre-supernova mass ($\sim 13 - 13.5\,$M$_\odot$) is consistent with that of red supergiant stars, while the relatively small estimated radius at the time of the explosion ($R_{\rm ini} \approx 287\,R_\odot$) can point to a yellow supergiant star.

[1] Universidad Andres Bello, Avda. Republica 252, Santiago, Chile (ktakats@gmail.com).

REVISITING TW HYDRAE IN LIGHT OF NEW ASTROMETRIC DATA

R. Teixeira[1,2], C. Ducourant[2,1], P. A. B. Galli[1,2], J. F. Le Campion[2], A. G. O. Krone-Martins[1,2,3], B. Zuckerman[4], G. Chauvin[5], and I. Song[6]

Our efforts in the present work focused mainly on refining and improving the previous description and understanding of the stellar association TW Hydrae (TWA) including a very detailed membership analysis and its dynamical and evolutionary age.To achieve our objectives in a fully reliable way we take advantage of our own astrometric measurements (Ducourant et al. 2013) performed with NTT/EFOSC2 - ESO (La Silla - Chile) spread over three years (2007 - 2010) and of those published in the literature.A very detailed membership analysis based on the convergent point strategy as developed by our team (Galli et al. 2012, 2013) allowed us to define a consistent kinematic group containing 31 stars among the 44 proposed as TWA member in the literature. Assuming that our sample of stars may be contaminated by non-members and to get rid of the particular influence of each star we applied a Jacknife resampling technique generating 2000 random lists of 13 stars taken from our 16 stars and calculated for each the epoch of convergence when the radius is minimum. The mean of the epochs obtained and the dispersion about the mean give a dynamical age of 7.5 ± 0.7 Myr for the association that is in good agreement with the previous traceback age (De La Reza et al. 2006). We also estimated age for TWA moving group members from pre-main sequence evolutionary models (Siess et al. 2000) and find a mean age of 7.4 ± 1.2 Myr. These results

show that the dynamical age of the association obtained via the traceback technique and the average age derived from theoretical evolutionary models are in good agreement.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas (IAG/USP).
[2] CNRS, LAB, UMR - Observatoire de Bordeaux.
[3] SIM/IDL - Depto. Física - Universidade de Lisboa.
[4] Dept. of Physics & Astronomy - UCLA.
[5] Lab. Astrophysique - Observatoire de Grenoble.
[6] Dept. of Physics & Astronomy - University of Georgia.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

DIFFERENTIAL CHEMICAL ABUNDANCES OF HEAVY ELEMENTS IN SOLAR TWINS

M. Tucci Maia[1] and J. Meléndez[1]

In this work we present differential chemical abundances of neutron-capture elements (Z >30) in solar twins. We have obtained high resolution (R = 60,000) and high S/N (>100) spectra of solar twins in the ultraviolet region (310-400nm) with the UVES spectrograph at the VLT/ESO. In the same configuration we also observed that the Sun, that is our reference for the differential analysis, thus obtaining results with high accuracy and precision. In the ultraviolet there is a large number of atomic transitions of heavy elements, which allows the detailed study of the r and s processes. Our sample of solar twins covers a wide range of ages, so it will be possible to study the temporal evolution of the neutron capture elements.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão, 1226, Cidade Universitária, São Paulo, Brasil (marcelotuccimaia@usp.br).

ON THE SENSITIVITY OF EXTRASOLAR MASS-LOSS RATE RANGES: HD 209458B A CASE STUDY

C. S. Villarreal D'Angelo[1], E. M. Schneiter[1,2], A. Costa[1,2], P. Velázquez[3], A. Raga[3], and A. Esquivel[3]

We present a 3D hydrodynamic study of the effect that different stellar wind conditions and planetary wind structures have on the calculated Lyα absorptions during the transit of HD209458b. We approach the problem using 3D hydrodynamic simulations. Considering a range of stellar wind speeds $\sim[350-800]$ km s^{-1}, coronal temperature $\sim [3-7]\times10^6$ K and two values of the polytropic index $\Gamma \sim [1.01-1.13]$, while keeping fixed the stellar mass loss rate, we found a that a $\dot{M}_p$ range between $\sim [3-5]\times10^{10}$g s^{-1} give account for the observational absorption in Lyα measured for the planetary system. Also, several models with anisotropic evaporation profiles for the planetary escaping atmosphere were carried out, showing that both, the escape through polar regions, resembling the emission associated with reconnection processes, and through the night side, produced by a strong stellar wind that compresses the planetary atmosphere and inhibits its escape from the day hemisphere yields larger absorptions than an isotropic planetary wind.

[1] Instituto de Astronomía Teórica y Experimental, CONICET-UNC(cvillarreal@oac.uncor.edu).
[2] Faculty of Ciencias Exactas, Físicas y Naturales UNC.
[3] Instituto de Ciencias Nucleares, UNAM.

INFRARED ACCRETION DISC MAPPING OF THE DWARF NOVA V2051 OPHIUCHI IN OUTBURST AND IN QUIESCENCE

E. Wojcikiewicz[1] and R. Baptista[1]

Dwarf novae are compact binaries where a late-type star (the secondary) fills its Roche lobe and transfers matter to a companion white dwarf (the primary) via an accretion disc. They show outbursts which recur on timescales of weeks to years, where the accretion disc brightens by factors 20 to 100 either due to a thermal-viscous instability in the disc (DI model) or to a burst of enhanced mass-transfer from the secondary (MTI model). We report time-series of fast photometry of the dwarf nova V2051 Oph in the J and H bands, obtained with the CAMIV at the 1.6 m telescope of Observatório Pico dos Dias/Brazil, during the decline of an outburst in 2005 June, and in 2008 when the object was in quiescence. We modeled the ellipsoidal variations caused by the secondary to infer its contribution to the J and H fluxes, and fitted stellar atmosphere models to find a photometric parallatic distance of $d = (111 \pm 14)pc$. Front-back brightness asymmetries in J and H-band eclipse maps along the decline from the 2005 outburst suggest that the accretion disc had a non-negligible opening angle which decreased as the disc cooled down. The time evolution of the disc radial temperature distribution along the outburst decline shows a cooling wave which *accelerates* as is travels inwards – in contradiction to a basic prediction from the DI model.

[1] Grupo de Astrofísica, Universidade Federal de Santa Catarina, Brazil (eduardo@astro.ufsc.br; bap@astro.ufsc.br).

MASS SEGREGATION OF YOUNG STAR CLUSTERS

J. Yu[1]

Mass segregation of the young star cluster is one of the dynamical properties which is an important tool to investigate the star forming process and dynamical evolution of star clusters. The origin of this mass segregation has been suggested as either primordial, that is, it is a result of the star formation process in which stars form mass segregated from their parent molecular cloud, or dynamical, i.e., resulting from fast dynamical evolution. Recent N-body simulations suggest initially dynamically cool and sub-structured star clusters can be mass segregated within very short timescale. We investigate the influence of different initial parameters to further constrain our theoretical model for young-mass segregated star clusters. In particular, we focus on the correlation between the morphology and the degree of mass segregation of the early evolution of young star clusters. We find that young star clusters cannot be highly mass segregated while they are still fractal. Therefore, we conclude that mass segregation of young star clusters is unlikely to be purely dynamical.

[1] Pontificia Universidad Católica de Chile (yujc@astro.puc.cl).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

GALAXIES

STELLAR FEEDBACK FROM BLACK-HOLE HIGH-MASS X-RAY BINARIES IN GALAXY FORMATION MODELS

M. C. Artale[1,2], P. B. Tissera[1,2], and L. J. Pellizza[1,3]

In recent years, many works have suggested the role of black-hole high-mass X-ray binaries (BH-HMXB) as potential sources of heating and re-ionization in the interstellar and intergalactic medium. Furthermore, because of the suggested increase of their production rate and X-ray luminosity with decreasing metallicity, BH-HMXBs could be relevant to explain the thermal and ionization history of the Universe at its early stages. As observations indicate, a meaningful amount of the energy released by these sources could be deposited in the local interstellar medium, suggesting that BH-HMXB could modify star forming regions on the host galaxy. In this work, we study the kinetic BH-HMXB feedback using hydrodynamical cosmological simulations which also include SNe feedback. Our preliminary results suggest that BH-HMBXs feedback is not efficient at modifying the star formation activity. However, due the complexity of the problem and the wide dynamical range needed to describe properly different physical events, there are still different schemes to explore. In the future, we will study the role of BH-HMXBs in high numerical resolution simulations at high redshifts, and how the energy is released into the interstellar medium.

[1] Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina.
[2] Instituto de Astronomía y Física del Espacio, Buenos Aires, Argentina.
[3] Instituto Argentino de Radioastronomía, Berazategui, Argentina.

THE LMC OUTER DISK STELLAR POPULATION IN THE LIGHT OF THE DARK ENERGY SURVEY

E. Balbinot[1,2], B. Santiago[1,2], L. Girardi[4], L. N. da Costa[2,3], and M. A. G. Maia[2,3]

The outermost regions of the Large Magellanic Clouds (LMC) have recently been covered by Dark Energy Camera (DECam) Science Verification data, in preparation for the Dark Energy Survey (DES). Although the DES footprint misses the bar and main star forming regions of the LMC, the available data sample a large and continuous area of the LMC disk down to $r \simeq 24$ at distances greater than 5 degrees from its center. This large surveyed region opened the possibility to study the outer LMC star formation history (SFH) with unprecedented detail. In this work we employ the partial models method (Gallart et al 1999; Javiel et al 2005) to recover the SFH and its spatial variations in the outskirts of the LMC from the observed colour-magnitude diagrams. We take the MW foreground stars into account by modelling them with TRILEGAL (Girardi et al. 2005). With this technique we were able to recover the spatial dependency of the LMC outer components SFH and estimate its extension as well as the inclination and depth of the LMC disk. As a byproduct of our

analysis we assembled a catalog of new LMC stellar clusters.

[1] Instituto de Física, UFRGS.
[2] Laboratório Interinstitucional de e-Astronomia.
[3] Observatório Nacional.
[4] Osservatorio Astronomico di Padova, INAF.

GALAXIES AT HIGH REDSHIFT

F. E. Bauer[1]

Recent years have seen tremendous progress in finding and charactering star-forming galaxies at high redshifts across the electromagnetic spectrum, giving us a more complete picture of how galaxies evolve, both in terms of their stellar and gas content, as well as the growth of their central supermassive black holes. A wealth of studies now demonstrate that star formation peaked at roughly half the age of the Universe and drops precariously as we look back to very early times, and that their central monsters apparently growth with them. At the highest-redshifts, we are pushing the boundaries via deep surveys at optical, X-ray, radio wavelengths, and more recently using gamma-ray bursts. I will review some of our accomplishments and failures.

Telescope have enabled Lyman break galaxies to be robustly identified, but the UV luminosity function and star formation rate density of this population at $z = 6 - 8$ seems to be much lower than at $z = 2 - 4$. High escape fractions and a large contribution from faint galaxies below our current detection limits would be required for star-forming galaxies to reionize the Universe. We have also found that these galaxies have blue rest-frame UV colours, which might indicate lower dust extinction at $z > 5$. There has been some spectroscopic confirmation of these Lyman break galaxies through Lyman-α emission, but the fraction of galaxies where we see this line drops at $z > 7$, perhaps due to the onset of the Gunn-Peterson effect (where the IGM is opaque to Lyman-α).

[1] Pontificia Universidad Católica de Chile.

METAL-POOR ACTIVE GALACTIC NUCLEI

I. C. Bicalho[1] and E. Telles[1]

Active galaxies are considered to be metal-rich, with metallicity ranging from solar to slightly supersolar. This is due to the fact that the active galaxy nuclei are usually found in supermassive galaxies. We aim to test this statement by obtaining near infrared spectra of peculiar dwarf galaxies to see if they host an AGN. We present the results based on analysis of data from Gemini Near Infrared Integral Field Spectrograph (NIFS) of the metal-poor HII galaxy SDSS J1047+0739 (12 + log O/H $\sim$ 7.85 $\pm$ 0.02). The spectrum of this galaxy shows strong permitted emission lines with extended wings, which is atypical for HII regions. We use unconventional methods such as PCA tomography due to the benefits that it provides to data cube analysis. We are studying the kinematics of the nuclear region and the regions of star formation surrounding it, mostly through the Paschen-α and He lines. We find that the broad line emission comes only from the unresolved central region. The results of this analysis agree well with the existence of an AGN in this metal-poor galaxy.

[1] Observatório Nacional, Ministério de Ciência e Tecnologia e Inovação.

ANALYSIS OF THE VELOCITY DATA OF CLUSTER A562

D. Calderón Espinoza[1] and P. Gómez[2]

We present a recent study of the dynamics of the cluster of galaxies Abell 562 intended to determine if ram pressure is responsible for the jet bending in the Wide-Angle Tailed (WAT) radio source located in the central elliptical galaxy. Given the properties of the jet and of the intra-cluster medium (ICM), a relative velocity between the galaxy and the ICM greater than 800 km/s is needed for this mechanism to bend the WAT jet. We find that the peculiar velocity of the WAT galaxy is 170$\pm$140 km/s which is not enough to produce the bending. This is based on the analysis of the velocity of 146 galaxy cluster members obtained with the Gemini Multi-Object Spectrometer (GMOS) at Gemini North. However, our analysis of these velocity data and archival Chandra data suggests that an off-axis merger occurred in this system. This type of merger typically produces bulk flow motions with peak velocities greater than 1000 km/s which should be enough to explain the bending of the jets.

[1] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

[2] Gemini South Observatory.

INTERNAL KINEMATICS OF H II GALAXIES

M. S. Carvalho[1] and H. Plana[1]

H II galaxies are dwarf galaxies characterized by high stellar formation rate with spectrum dominated by strong emission lines, superimposed on a weak stellar continuum. The study of internal kinematics of these objects may be realized using the observed emission lines. Based on these lines we obtained monochromatic intensity, velocity dispersion and radial velocity maps.

We have studied the internal kinematics of two H II galaxies: UM 461 and CTS 1020, observed with the Gemini South telescope using the GMOS instrument equipped with an IFU.

We aim to investigate the origin of the line-broadening observed on emission lines from the use of kinematics diagnostic diagrams: $I\ vs\ \sigma$, $I\ vs\ V$, e $V\ vs\ \sigma$. The analysis of these diagrams was based on the *Cometary Stirring Model* that allows us to identify, for example, the presence of expanding shells and stellar winds.

We found that radial velocity and velocity dispersion maps, for each galaxy, show a different kinematical pattern, although both are H II galaxies. CTS 1020 shows a velocity gradient consistent with a rotating disc with a velocity amplitude of $\sim$40 km s^{-1}. On the other hand UM 461 does not exhibit a typical pattern of a rotating system, despite of the observed velocity gradient in both emission nuclei.

[1] Laboratorio de Astrofisica Teorica e Observacional - UESC - Ilheus - Brazil.

EMISSION LINE IMAGING SURVEY OF THE ABELL 901/902 SUPERCLUSTER

A. Chies-Santos[1], B. Rodriguez del Pino[1], A. Aragón-Salamanca[1], S. Bamford[1], and M. Gray[1]

It is widely debated whether galaxy evolution is more prone to internal or external effects. Trends to passive and/or more spheroidal populations in dense environments are widely observed and star-formation rate and stellar age and AGN fraction all correlate with measurements of the local galaxy density. However, in the hierarchical framework of galaxy formation the galaxies in the densest peaks start forming stars and assembling mass earlier making stellar mass one of the key determinants of galaxy properties. Nonetheless environmental effects are still very important and could be separated from the effect of internal galaxy properties. The Abell 901(a,b)/902 multiple cluster system at $z \sim 0.165$ is a unique laboratory for galaxy evolution. Besides three main clusters it includes a few related groups. The field comprises a very broad range of galaxy environments and masses at a single redshift. Therefore by observing this single region one is able to study galaxy evolution decoupling environmental and stellar mass effects from redshift-related ones. We are currently undertaking a survey of the region with the OSIRIS tunable filter imager on the GRANTECAN. We have targeted the Hα and [NII]λ6584 lines Together, these will provide the urgently needed star formation rate and AGN diagnostics for a full census of such properties in this field. In this talk I will present the first results of the survey on the high density regions A901a and A902 probing AGN and star formation.

[1] University of Nottingham, UK

DYNAMICAL ANALYSES OF Z= 0.3, 0.5 GALAXY CLUSTERS FROM THE SOAR GRAVITATIONAL ARCS SURVEY

N. Cibirka[1], E. Cypriano[1], G. Caminha[2], and M. Makler[2]

We have performed dynamical analyses of galaxy clusters using optical spectroscopic data. These clusters belong to the SOAR Gravitational Arcs Survey (SOGRAS) (Furlanetto et al. 2013) and are among the richest structures in SDSS stripe 82 with redshifts around z= 0.3 or z= 0.5. For three of those clusters, all with strong lensing features, we carried out individual analysis using Gemini/GMOS data ($\sim$ 25 velocities per cluster). We obtained masses in the range of $3-8\times10^{14}$ M$_\odot$ and signs of substructure in one of them. For the whole SOGRAS sample (47 clusters) we used SDSS spectroscopic data. Given the low number of velocities per clusters, we stacked the data per redshift and/or richness. Our results indicate that the richest half of the clusters, independently of the redshift, tend to be $\sim$ 2.5 times more massive than the poorest half. Also we have found

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

that the z= 0.3 and the z= 0.5 clusters have overall masses statistically consistent with each other: $6.3(^{+3.9}_{-2.1})$ and $8.6(^{+5.2}_{-1.6}) \times 10^{14} M_{\odot}$ respectively.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo.
[2] Centro Brasileiro de Pesquisas Físicas.

THE CONNECTION BETWEEN THE ORIGINS OF GLOBULAR CLUSTERS (GCS) AND THE EVOLUTION OF THEIR HOST GALAXY

A. Cortesi[1], C. Mendes de Oliveira[1], A. Chies-Santos[2], S. Bamford[2], M. Merrifield[2], A. Romanowsky[3], J. Arnold[3], V. Pota[4], D. Forbes[4], L. Coccato[5], J. Brodie[3], C. Usher[4], J. Strader[6], and C. Foster[6]

Star kinematics is directly connected to the evolution history of their host galaxy. To recover the correct kinematics, though, it is necessary to assign each star to the galaxy component it belongs to: the disk (thin or thick) or the spheroid. Performing a multiband decomposition of infrared images of NGC 3115, and planetary nebulae (PNe) as tracers of the overall stellar populations, we recovered the velocity and velocity dispersion of the thick disk and of the spheroid. We then studied the GCs population in NGC 3115. Given a GC position and velocity we can estimate its probability of belonging to the disk, to the spheroid and in general to the system. We find that most GCs are consistent of being drawn from the light weighted velocity distribution of NGC 3115 stars. Nearly half of the GCs belongs to the disk and half to the spheroid, but we don't find any trend between their colour (b-r) or calcium triplet abundances and their kinematics.

[1] IAG, USP, Sao Paulo, Brasil.
[2] School of Physics and Astronomy, University of Nottingham, University Park, Nottingham.
[3] University of California Observatories, Santa Cruz, USA.
[4] Centre for Astrophysics & Supercomputing, Swinburne University, Hawthorn, Australia.
[5] European Southern Observatory, Garching, Germany.
[6] Michigan State University.
[7] Australian Astronomical Observatory.

STAR FORMING, AGN AND PASSIVE PHASES OF GALAXY EVOLUTION SINCE Z = 0.5 AS TOLD BY SDSS DATA

M. V. Costa-Duarte[1,2], G. Stasińska[2], N. V. Asari[3], R. Cid Fernandes[3], and L. Sodré Jr.[1]

Our goal is to study the interplay between star forming, AGN and passive phases of galaxy evolution. For that we need a wide database of galaxy spectra, binning the sample into stellar mass and redshift bins to deal with mass-dependent evolution and completeness. We extracted our galaxy sample from de SDSS/DR7 between 0.05<z<0.50. The stellar mass and the emission line measurements were taken from the STARLIGHT database and average values of galaxy properties were obtained for each bin. In order to distinguish star forming and AGN hosts, we first considered the BPT diagram as it is generally used. Higher stellar mass migrates to the right wing as redshift decreases and one can erroneously infer that the importance of AGN versus star formation increases with time for these objects. However the BPT diagram cannot distinguish retired galaxies from AGN hosts. For that purpose, the WHAN diagram can be used. Purely star forming galaxies dominates at low stellar mass bins while as the mass increases the AGN becomes more significant. Retired and lineless galaxies dominate the galaxy population at the highest stellar mass bins.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas - Universidade de São Paulo.
[2] LUTH- L'Observatoire de Paris.
[3] Universidade Federal de Santa Catarina.

GALAXY CONCENTRATION INDEX IN LOW X-RAY LUMINOSITY GALAXY CLUSTERS

H. Cuevas[1], J. L. Nilo Castellón[1], and M. V. Alonso[2]

Using a sample of 10 low x-ray luminosity galaxy clusters (Nilo Castellón et al. 2013B), we studied the properties of 146 galaxies classified as members in a redshift range of $0.185 < z < 0.701$.

Following Concelice et al. 2000, we define the galaxy concentration index (C) , as the ratio of two circular radii which contain 80 and 20 percent of the total Petrosian flux. Mainly, we observed an increment of C for early-type and lenticular galaxies at redshifts lower than 0.3, that can be related to the presence of giant galaxies in these low redshift clusters ($C > 4$). Contrary to these results, for late-type galaxies we found smaller C values for the lower redshift clusters.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

These results could be associated to the morphological evolution of galaxies, as proposed by different authors (Poggianti et al. 2009, Dressler et al. 2009) for rich clusters.

[1] Departamento de Física, Universidad de La Serena, Chile.
[2] Instituto de Astronomía Teórica y Experimental (IATE-CONICET), Argentina.

THE RELATION BETWEEN THE SPECTRAL SYNTHESIS OF GALAXIES IN THE VISIBLE REGION AND THEIR UV EMISSION

M. L. Dantas[1] and L. Sodré Jr.[1]

The STARLIGHT Project has analyzed almost a million spectra extracted from the Sloan Digital Sky Survey (SDSS) by using the empirical spectral synthesis approach described by Cid Fernandes et al.(2005). Spectral synthesis consists on the optical spectrum fitting by using simple stellar population libraries, such as Bruzual & Charlot (2003). It also considers the reddening caused by dust and the velocity dispersion due to the motion of the stars within the galaxy. Since the model that best fits the optical region can also be extended to the ultraviolet, we compare our predictions to the UV photometry of the same galaxies measured by the GALEX satellite, studying the systematics and nature of the differences. In this current presentation, we show the upcoming challenges in order to accomplish this investigation. The main motivation of this study is to obtain realistic spectral models from the UV to the optical regions for the study of high redshift galaxies.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo

RESOLVING GALAXIES IN TIME AND SPACE: APPLYING STARLIGHT TO CALIFA DATA CUBES

A. L. de Amorim[1,2], R. Cid Fernandes[1, 2], E. Pérez[2], R. García Benito[2], R. M. González Delgado[2], S. F. Sánchez[2, 3], B. Husemann[4], J. Falcón Barroso[5, 6], P. Sánchez Blázquez[7], C. J. Walcher[4], and D. Mast[2, 3]

Fossil record methods based on spectral synthesis techniques have matured over the past decade, and their application to integrated galaxy spectra fostered substantial advances on the understanding of galaxies and their evolution. Yet, because of the lack of spatial resolution, these studies are limited to a global view, providing no information about the internal physics of galaxies. Motivated by the CALIFA survey, which is gathering Integral Field Spectroscopy over the full optical extent of 600 galaxies, we have developed an end-to-end pipeline which: (i) partitions the observed data cube into Voronoi zones in order to, when necessary and taking due account of correlated errors, increase the S/N, (ii) extracts spectra, including propagated errors and bad-pixel flags, (iii) feeds the spectra into the STARLIGHT spectral synthesis code, (iv) packs the results for all galaxy zones into a single file, (v) performs a series of post-processing operations, including zone-to-pixel image reconstruction and unpacking the spectral and stellar population properties into multi-dimensional time, metallicity, and spatial coordinates. This work provides a description of this whole pipeline and its data products. These include 3D cubes of the stellar formation history, 2D maps of galaxy properties such as the v-field, stellar extinction, mean ages and metallicities, mass surface densities, star formation rates on different time scales and normalized in different ways, 1D averages in the temporal and spatial dimensions, projections of the stellar light and mass growth (x,y,t) cubes onto radius-age diagrams, etc. The results illustrate the richness of the combination of IFS data with spectral synthesis, providing a glimpse of what is to come from CALIFA and future IFS surveys.

[1] Universidade Federal de Santa Catarina.
[2] Instituto de Astrofísica de Andalucía.
[3] Centro Astronómico Hispano Alemán, Calar Alto.
[4] Leibniz-Institut für Astrophysik Potsdam.
[5] Instituto de Astrofísica de Canarias.
[6] Universidad de La Laguna, Tenerife.
[7] Universidad Autónoma de Madrid.

OPEN CLUSTER RADIAL VELOCITY DETERMINATION FROM OBSERVATIONS AT OBSERVATÓRIO PICO DOS DIAS

M. A. F. Faria[1], H. Monteiro[1], W. S. Dias[1], and J. R. D. Lépine[2]

In studies of the dynamics of the Galactic disk, such as the determination of the speed of the spiral pattern and the permanence of stars in the spiral arms, it is crucial to know orbits obtained from proper

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

motions, radial velocities and the potential of the Galaxy. Aiming to improve the statistics of our catalog of open clusters, maintained by our research group, we determined the radial velocity of stars belonging to a group of open clusters using spectra with a resolution of 4000, obtained at the Pico dos Dias Observatory (LNA) with the 1.60 m telescope and the Coudé spectrograph.

We observed the open cluster's member stars and calculated their radial speeds using standard techniques. The stars were selected from our own database based on relevant information concerning the clusters, obtained by statistical analysis of their proper motions and/or their position in the HR's diagram. In this work, we present the detailed analysis of the data reduction and radial velocity determination using synthetic spectra from different libraries. Finally we present the open cluster's radial (and spacial) velocities.

[1] Universidade Federal de Itajubá.
[2] Instituto de Astronomia, Geofísica e Ciências Atmosféricas.

THE FORMATION OF DSPH GALAXIES

M. Fellhauer[1], P. Assmann[1,2], and M. I. Wilkinson[3]

Dwarf spheroidal (dSph) galaxies are considered the basic building blocks of the galaxy formation process in the ΛCDM (Lambda Cold Dark Matter) hierarchical cosmological model. These galaxies are believed to be the most dark matter (DM) dominated systems known, have the lowest stellar content, and are poor in gas. Many theories attempt to explain the formation of dSph galaxies resorting to the fact that these galaxies are mainly found orbiting large galaxies or invoking other mechanisms of interactions. Here we show the full set of simulation as an extension of our fiducial model, where we study the formation of classical dSph galaxies in isolation by dissolving star clusters within the DM halo of the dwarf galaxy. In our parameter survey we adopt cored and cusped DM halo profiles and consider different numbers of dissolving star clusters. We investigate the dependency of observable quantities with different masses and scale-lengths of the DM halo and different star formation efficiencies (SFE). We find that our proposed scenario explains many features of the classical dSph galaxies of the Milky Way, like their morphology and their dynamics. We see trends how the surface brightness and the scale-length of the luminous component vary with the parameters of our simulations. We also identify how irregularities in their shape, i.e. clumpiness and ellipticity vary in our simulations. In velocity space, we identify the parameters leading to flat velocity dispersions curves. We recognize kinematically cold substructures in velocity space, named fossil remnants and stemming from our unique initial conditions, which alter the expected results. These streaming motions are considered as a key feature for future observation with high resolution to validate our scenario.

[1] Departamento de Astronomia, Universidad de Concepcion, Chile.
[2] Departamento de Astronomia, Universidad de Chile, Chile.
[3] Department of Physics & Astronomy, University of Leicester, UK.

A KINEMATIC STUDY OF DIFFERENT POPULATIONS IN THE GALAXY NGC 6822

S. Flores-Durán[1], M. Peña[1], L. Hernández-Martínez[1], and J. García-Rojas[2]

The kinematics of planetary nebulae (PNe) and HII regions in the irregular galaxy NGC 6822 is analyzed through high resolution spectroscopy from LCO-Clay-MIKE and OAN-2.1m-MES telescopes-spectrographs. The data have a resolution better than 10 km/s. The heliocentric radial velocities of these objects are compared to the kinematics of the extended HI disk found in this galaxy. The analysis shows that HII regions and other members of the young stellar population follow closely the rotation of the HI disk. On the contrary, PNe are not moving along with the HI gas and their kinematics is closer to the behavior of the spheroid of C stars, which is a system with different spatial distribution and kinematics. Thus we confirm that NGC 6822 has at least two very different kinematical systems with different spatial distribution: the rotating HI disk where the young population resides, and the stellar spheroid containing the intermediate-old population.

[1] Instituto de Astronomía, Universidad Nacional Autónoma de México, Apartado Postal 70264, 04510 Méx. D.F., México. (sflores@astro.unam.mx).
[2] Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

AM 2217-490: A POLAR RING GALAXY UNDER CONSTRUCTION

P. Freitas-Lemes[1], I. Rodrigues[1], M. Faúndez-Abans[2], and O. Dors[1]

This work is part of a series of case studies of Polar Ring Galaxies (PRGs) (see also Posters GAL-1: 163, GAL-2: 178). A PRG is formed by an early type host galaxy (e.g. lenticular or elliptical), surrounded by a ring of gas and stars orbiting approximately at the polar plane of the host galaxy. AM2217-490 is an interesting case of PRG in formation, with a still asymmetrical ring that surrounds the host galaxy. Apparently, this bluish structure (characteristic of the rings of PRGs), is not yet in equilibrium with the host galaxy. This study is based on spectra on the range 6250–7250 Å obtained with the CTIO 1.5 m telescope - Chile. From them, we measure a heliocentric radial velocity of 9152 ± 18 km/s. The value of the ionization parameter ($\log U = -3.5$) is similar to that in interacting galaxies (Freitas-Lemes et al. 2013, submitted to MNRAS; and Krabbe et al. 2013, MNRAS Accepted), and lower than that of isolated ones. The electron density shows little variation along the major axis of the host galaxy, and a mean value typical of interacting galaxies. Diagnostic diagrams show that the nuclear region harbors an AGN, following a trend among polar ring galaxies. The low-resolution images of the SDSS show no tails or bridges connecting the galaxy to other objects, however, in a radius of 5 arcmin there are three other galaxies with similar speeds, featuring a group. A plausible hypothesis is that one of these galaxies may have interacted with AM2217-490, donating material to form the ring.

[1] UNIVAP /IPD, Av. Shishima Hifumi, 2911 - Urbanova - São José dos Campos - SP, priscila@univap.br, irapuan@uivap.br, olidors@univap.br
[2] MCTI/Laboratório Nacional de Astrofísica, Coordenação de Apoio Científico. Rua Estados Unidos 154 - Itajubá - MG, mfaundez@lna.br

THE EFFECTS OF INTERACTION ON THE KINEMATICS AND ABUNDANCE OF AM 2229-735

P. Freitas-Lemes[1], I. Rodrigues[1], O. Dors[1], and M. Faúndez-Abans[2]

This observational study is about the effects of interaction on the kinematics and chemical abundance of the component galaxies of AM 2229-735. This system is formed by a disk galaxy, NED01, and a compact perturbed Sb(s)-like galaxy, NED02, the latter showing a tail and counter-tail arc-shaped feature. This system could be a progenitor of a polar ring galaxy. The sky-projected tail is very luminous and seems to connect the galaxies. Our study was based on BVRI broad band imagery as well as long-slit spectroscopy in the wavelength range 4100-8600 Å. We estimated heliocentric radial velocities of 17518±25 km/s (NED01) and 17326±27 km/s (NED02). Standard diagnostic diagrams were used to classify the main ionizing source of selected emission-line regions. It turns out that all regions are mainly ionized by massive stars. Using two empirical methods, we found that the HII regions in AM2229-735 have high metallicity: $12+log(O/H) = 8.3-8.6$ dex.

[1] UNIVAP /IPD, Av. Shishima Hifumi, 2911 - Urbanova - São José dos Campos - SP, priscila@univap.br, irapuan@uivap.br e olidors@univap.br
[2] MCTI/Laboratório Nacional de Astrofísica, Coordenação de Apoio Científico. Rua Estados Unidos 154, Itajubá, MG, mfaundez@lna.br

THE IMPACT OF GAS BULK ROTATION ON THE LYMAN-α LINE

J. N. Garavito-Camargo[1], J. E. Forero-Romero[1], and M. Dijkstra[2]

We present results of radiative transfer calculations to measure the impact of gas bulk rotation on the morphology of the Lyman α line in galaxies. We model a galaxy as a sphere with a homogeneous mixture of dust and hydrogen at a constant temperature. These spheres have a solid-body rotation with maximum velocities in the range $0 - 300$ km s^{-1} and neutral hydrogen optical depths in the range $\tau_{\rm H} = 10^5 - 10^7$. We also consider two kinds of spatial distribution for the radiation sources with respect to the sphere: central and homogeneous. We find that the line width and the intensity at the line's center increases with rotational velocity. In the case of homogeneously distributed sources, for large rotational velocities the line transforms from a double peak to a single peak at the line center. Under the same conditions the escape fraction increases $\sim 30\%$. For radiation sources located off-center, the line morphology presents a range of single, double and triple peaked

lines. We show how these results are useful to interpret recent spectroscopic results of distant $z \sim 2-3$ star forming galaxies.

[1] Departamento de Física, Universidad de los Andes, Cra. 1 No. 18A-10, Edificio Ip, Bogotá, Colombia.
[2] Max Planck Institute for Astrophysics, Karl-Schwarzschild-Str. 1, 85741, Garching, Germany.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

PHOTOMETRY AND DYNAMICS OF THE MINOR MERGER AM 1219-430 WITH GEMINI GMOS-S

J. A. Hernandez-Jimenez[1], M. G. Pastoriza[1], I. Rodrigues[2], A. C. Krabbe[2], C. Winge[3], and C. Bonatto[1]

This work is based on r' and g' images and long-slit spectra obtained with the GMOS at the Gemini South Telescope. We detected a tidal tail in the main galaxy (AM 1219A) and a bridge of material connecting the galaxies. The surface brightness profile of AM 1219A was decomposed into bulge and disc components. The profile shows a light excess of $\sim$ 53% due to the contribution of star-forming regions. On the other hand, the surface brightness profile of the secondary galaxy shows a lens structure in addition to the bulge and disc. The rotation curve of AM 1219A is quite asymmetric, suggesting a gas perturbed by interaction. The overall best-fitting solution for the mass distribution of AM 1219A was found with M/L for bulge and disc of $\Upsilon_b = 2.8^{+0.4}_{-0.4}$ and $\Upsilon_d = 2.4^{+0.3}_{-0.2}$, respectively, and a NFW profile of $M_{200} = 2.0^{+0.5}_{-0.4} \times 10^{12}\, M_\odot$ and $c = 16.0^{+1.2}_{-1.1}$.

[1] Instituto de Física, Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500, Cep 91501-970, Porto Alegre, RS, Brazil.
[2] Universidade do Vale do Paraíba, Av. Shishima Hifumi, 2911, Cep 12244-000, São José dos Campos, SP, Brazil.
[3] Gemini Observatory, c/o AURA Inc., Casilla 603, La Serena, Chile.

PHYSICAL PROPERTIES OF GALAXIES IN THE SLOAN DIGITAL SKY SURVEY DETECTED IN INFRARED

F. R. Herpich[1,2], A. Mateus[2], R. Cid Fernandes[2], E. A. D. Lacerda[2], A. L. de Amorim[2], L. L. Rossi[3], M. M. Cendron[3], V. B. Klein[3], M. M. Parize[3], and F. J. Braz[3]

The extragalactic astrophysics is experiencing a golden age with the availability of an almost inconceivable amount of observational data and projects in different spectral regions. Our research group at UFSC, in collaboration with other researchers from Brazil and France, was successful in following these new challenges, especially with the spectroscopic analysis of the SDSS data. The result of this effort was to build a database of physical properties of galaxies to nearly 1 million objects, which is completely public. Recently we also started analyzing data from the GALEX ultraviolet, spectral broadening our coverage. In this work, we continue this expansion, focusing our attention in the infrared region of the electromagnetic spectrum with the inclusion of font catalogs obtained a recently mission, the WISE project. We increase our database with the data obtained from the WISE and made the match in the catalog of creating a subsample of SDSS galaxies about 300 000 objects. These objects are analyzed using a new computational tools in order to identify the properties in the infrared. This is done in conjunction with the Department of Computer Science of Santa Catarina Federal Institute. In the first analysis, we obtain a clear separation between star forming galaxies (SF) and "retired" galaxies (RT). In this work, we present the latest results of the analysis of this data.

[1] Centro de Ciências Físicas e Matemáticas - CFM, Universidade Federal de Santa Catarina – Bloco G – Sala 203 Campus Universitário Trindade, Cx. Postal 476 – CEP 88040–900, Florianópolis, SC, Brazil (herpich@astro.ufsc.br).
[2] Universidade Federal de Santa Catarina – UFSC.
[3] Instituto Federal Catarinense – IFC Campus Videira.

STAR FORMATION RATES OF DS GALAXIES

A. M. Hidalgo-Gámez[1], I. Vega-Acevedo[1], and M. A. Magaña-Serrano[1]

The Star Formation Rate of a sample of nine dwarf spiral galaxies and ten late-type Sm is determined from the Hα luminosity. The main interest was to check if these two kind of late-type galaxies have similar SFR or not. The images were acquired at the 1.5m telescope of the SPM-OAN and they were reduced with the software MIDAS. The values of the SFR are very similar for both type of galaxies and also similar to other Sm galaxies. The main result is that the dwarf spiral galaxies are more efficient when forming stars than the Sm galaxies because the SFR

per are are lower for the latter with the same gas density than for dwarf spirals. However, the SFRs are larger in the Sm galaxies. In addition, the SFR per area were compared with global properties of the galaxies. There is only a relationship between the SFR and the surface brightness as well as with the absolute blue magnitude, but no relationship with the optical radius. A larger sample is needed in order to obtain a more conclusive answer.

[1] Escuela Superior de Física y Matemáticas, Instituto Politécnico Nacional.

THE EFFECTS OF DARK MATTER HALO ON THE MASS LOSS PROCESS IN DWARF GALAXIES: RESULTS FROM 3D HYDRODYNAMICAL SIMULATIONS

G. A. Lanfranchi[1], L. O. Ruiz[1], D. Falceta-Goncalves[2], and A. Caproni[1]

Theoretical Λ CDM cosmological models predict a much larger number of low mass dark matter haloes than has been observed in the Local Group of galaxies. One possible explanation is the increased difficulty of detecting these haloes if most of the visible matter is lost at early evolutionary phases through galactic winds. In this work we study the current models of triggering galactic winds in dwarf spheroidal galaxies (dSph) from supernovae, and study, based on 3D hydrodynamic numerical simulations, the correlation of the mass loss rates and important physical parameters as the dark matter halo mass and the star formation rate. We find that the existence of winds is ubiquitous, independent on the gravitational potential, as would be expected. This because our simulations revealed that the Rayleigh-Taylor Instability (RTI) may play a major role on pushing matter out of these systems, even for very massive haloes. However, as already reported in previous works we have found a correlation between the mass loss rate and both the halo mass and the rate of supernovae. Besides, the epoch in which most of the baryon galactic matter is removed from the galaxy varies depends on those quantities. This result, combined to the importance of the RTI in each model, may change our understanding about the chemical evolution of dwarf galaxies, as well as in the heavy element contamination of the intergalactic medium at high redshifts.

[1] NAT - Universidade Cruzeiro do Sul, SP, Brasil.

[2] EACH/USP, SP, Brasil.

GALAXY AND MASS ASSEMBLY (GAMA): THE CONNECTION BETWEEN METALS, SPECIFIC SFR AND H I GAS IN GALAXIES: THE Z-SSFR RELATION

M. A. Lara-Lopez[1], A. M. Hopkins[1], and GAMA team

We study the interplay between gas phase metallicity (Z), specific star formation rate (SSFR) and neutral hydrogen gas (HI) for galaxies of different stellar masses. Our study uses spectroscopic data from Galaxy and Mass Assembly (GAMA) and Sloan Digital Sky Survey (SDSS) star-forming galaxies, as well as HI detection from the Arecibo Legacy Fast Arecibo L-band Feed Array (ALFALFA) and Galex Arecibo SDSS Survey (GASS) public catalogues. We present a model based on the Z-SSFR relation that shows that at a given stellar mass, depending on the amount of gas, galaxies will follow opposite behaviours. Low-mass galaxies with a large amount of gas will show high SSFR and low metallicities, while low-mass galaxies with small amounts of gas will show lower SSFR and high metallicities. In contrast, massive galaxies with a large amount of gas will show moderate SSFR and high metallicities, while massive galaxies with small amounts of gas will show low SSFR and low metallicities. Using ALFALFA and GASS counterparts, we find that the amount of gas is related to those drastic differences in Z and SSFR for galaxies of a similar stellar mass. The results of this study were publish recently in a "letter to the editor" (Lara-Lopez, M. A. et al. 2013, MNRAS, 433, L35).

[1] Australian Astronomical Observatory, PO Box 915, North Ryde, NSW 1670, Australia.

E+A GALAXIES IN THE SDSS. STELLAR POPULATION AND MORPHOLOGY

R. Leiva[1] and G. Galaz[1]

Galaxies with E+A spectrum have deep Balmer absorption and no H_α and $[OII]$ emission. This suggest recent star formation and the lack of ongoing star formation. With an E+A sample from the SDSS DR 7 (Aihara et al. 2011) we study the morphology

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

with Galaxy Zoo 1 data and the star formation history fitting models from Bruzual & Charlot (2003).

We found an underpopulation of spiral and disk like galaxies and an overpopulation of interacting galaxies, the last seems consistent with the scenario where, at low z, the interaction mechanism is responsible for at least part of the E+A galaxies.

The star formation history (SFH) fits most of the spectra indicating an increased star formation around 2 Gyr in the past. Additional parameters like dust internal extinction need to be included to improve the fitting.

[1] Instituto de Astrofísica, Pontificia Universidad Católica de Chile, Vicuña Mackenna 4860, 7820436 Macúl, Santiago, Chile (rodleiva@astro.puc.cl).

THE ROLE OF THE COROTATION RESONANCE IN THE SECULAR EVOLUTION OF DISKS OF SPIRAL GALAXIES

J. R. D. Lepine[1], S. Scarano Jr.[2], D. A. Barros[1], T. C. Junqueira[1], W. S. Dias[3], and S. Andrievsky[4]

The corotation resonance plays an important role in the evolution of the disks of spiral galaxies, and in particular, of our Galaxy. Its effect on the chemical abundance gradients is even a tool to estimate the age of the present spiral arm structure, which we find to be long-lived, contrary to a recent common belief. The metallicity gradients usually decrease in the inner regions and become flat or rising at larger radii. In several galaxies, including the Milky Way, one observes not only a change in the slope of the abundance gradient, but also an abrupt step in metallicity at corotation. This step is because the corotation resonance separates the disk of a galaxy in two regions (inside corotation and outside corotation) which are isolated one from the other, so that the two sides evolve in an independent way. The barrier between the two regions is the result of the flow of gas in opposite directions on the two sides and by the ring-shaped void of gas observed at corotation. We investigated a sample of galaxies, which have a known corotation radius, and for which there are measurements of abundance gradients of Oxygen available in the literature. A very good correlation is found between corotation radii and the radii at which there is a break in the slope of the gradients. Besides this, an independent effect of corotation is a minimum of star formation associated with the minimum velocity at which the interstellar gas feeds the spiral arms (seen as potential wells and star-formation machines). Still another effect is the scattering of stars by the resonance, which causes their migration to different galactic radii.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, São Paulo, SP, Brazil.
[2] Universidade Federal de Sergipe - Departamento de Física DFI/CCET, São Cristovão, SE, Brazil.
[3] Instituto de Física e Química, Universidade Federal de Itajubá, Itajubá MG, Brazil.
[4] Department of Astronomy and Astronomical Observatory, Odessa National University, Odessa, Ukraine.

STAR FORMATION HISTORY OF CALIFA GALAXIES IN THE OPTICAL AND UV

R. López-Fernández[1], R. M. González Delgado[1], R. Cid Fernandes[2], E. Pérez[1], and R. García Benito[1]

CALIFA is a spectroscopic survey of 600 nearby galaxies ($0.005 < z < 0.03$). CALIFA provides a unique and very useful set of data for galaxies covering the color-magnitude diagram from Mr = -23 mag to Mr = -18 mag, a large range of masses (109-12 $M_{\odot}$) and morphological types (from E to Sc), and allow us to obtain the spatially resolved properties of galaxies. The spectral range of the CALIFA sample is ideal for studying stellar populations because it contains the Balmer series and the 4000 Å break, among other useful tracers. However, there are age-metallicity-extinction degeneracies, which produce uncertainties in estimation of the physical properties of the stellar population. So we combine CALIFA spectroscopic data with photometric data in the ultraviolet range obtained with the GALEX mission in order to break these degeneracies, including data that provide additional information about the young stellar populations, which contribute to a lesser extent in the optical range. We perform a full spectral synthesis at the optical range plus the two UV GALEX filters with a new version of the fitting code STARLIGHT.

[1] Instituto de Astrofísica de Andalucía, CSIC, Granada, Spain.
[2] Universidade Federal de Santa Catarina, Florianópolis, Brasil.

THE SOAR GRAVITATIONAL ARC SURVEY

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

M. Makler[1], C. Furlanetto[2,3], B. X. Santiago[2,3], G. B. Caminha[1], E. Cypriano[4], N. Cibirka[4], M. E. S. Pereira[1], C. R. D. Bom[1], M. P. Lima[1,5], C. H. Brandt[1], A. F. Neto[3], J. Estrada[6], H. Lin[6], J. Hao[6], T. M. McKay[7], L. A. N. da Costa[3,8], and M. A. G. Maia[3,8]

We present the first results of the SOAR Gravitational Arc Survey (SOGRAS). The survey imaged 47 clusters in two redshift intervals centered at $z = 0.27$ and $z = 0.55$, targeting the richest clusters in each interval. Images were obtained in the g', r' and i' bands with a median seeing of 0.83, 0.76 and 0.71 arcsec, respectively, in these filters. Most of the survey clusters are located within the Sloan Digital Sky Survey (SDSS) Stripe-82 region and all of them are in the SDSS footprint. We present the first results of the survey, including the 6 best strong lensing systems, photometric and morphometric catalogs of the galaxy sample, and cross matches of the clusters and galaxies with complementary samples (spectroscopic redshifts, photometry in several bands, X-ray and Sunyaev Zel'dovich clusters, etc.), exploiting the synergy with other surveys in Stripe-82. We apply several methods to characterize the gravitational arc candidates, including the Mediatrix method (Bom et al. 2012) and ArcFitting (Furlanetto et al. 2012), and for the subtraction of galaxy cluster light. Finally, we apply strong lensing inversion techniques to the best systems, providing constraints on their mass distribution. The analyses of a spectral follow-up with Gemini and the derived dynamical masses are presented in a poster submitted to this same meeting (Cibirka et al.).

Deeper follow-up images with Gemini strengthen the case for the strong lensing nature of the candidates found in this survey.

[1] Centro Brasileiro de Pesquisas Físicas.
[2] Departamento de Astronomia, Universidade Federal do Rio Grande do Sul.
[3] Laboratório Interinstitucional de e-Astronomia.
[4] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo.
[5] Instituto Nacional de Pesquisas Espaciais.
[6] Center for Particle Astrophysics, Fermi National Accelerator Laboratory.
[7] Department of Physics, University of Michigan.
[8] Observatório Nacional.

THE ENVIRONMENTAL PROPERTIES OF GALAXIES PROBED BY MARKED STATISTICS

A. Mateus[1]

Galaxies are generally treated as point particles in clustering analysis. However, these objects have physical and stellar population properties that must be taken into account if one wants to study the environmental effects on galaxy evolution. In this work, we applied a statistical method to investigate the role of environment in driving galaxy properties based on the marked correlation function. This methodology was applied to a galaxy sample drawn from the Sloan Digital Sky Survey Data Release 7, where the clustering of galaxies was weighted by particular galaxy properties, like luminosity and stellar mass, thus more directly quantifying the correlations between these attributes and large-scale environment. We show that marked statistics are powerful to reproduce environmental trends for variables like luminosities and stellar masses, as well as to quantify the relative importance of them with respect to the environment. For low density regions in the local universe, mark correlations relative to the mean are stronger compared to dense regions. This implies that the clustering of stellar mass, for instance, is more sensitive to environments associated to individual halos in close galaxy pairs than to massive halos found in clusters, where the correlations don't show any difference relative to the mean. We conclude that in nearby galaxy clusters, dominated by massive objects, galaxies are equally clustered (marked correlation = average clustering). On the other hand, galaxies in low density regions span a wide range in stellar mass (halo sizes) where the correlations appear more dramatically.

[1] Universidade Federal de Santa Catarina, Brazil.

A NEW CLASS OF GALAXIES (?): ULTRA-COMPACT DWARFS

S. Mieske[1]

I propose to give a review on ultra-compact dwarf galaxies (UCDs), a new class of stellar systems defining the interface between star clusters and dwarf galaxies. UCDs are believed to be either the most massive star clusters in the universe, tidally truncated galaxies, or, both. After a brief overall summary, I will focus in particular on two aspects. 1. The specific frequencies of UCDs - a recently introduced quantity that allows to test whether the luminosity distribution of UCDs follows the bright tail of the globular cluster luminosity function. Can all UCDs

be explained as bright star clusters? 2. The elevated dynamical M/L ratios of UCDs. Are they due to highly clustered dark matter, a variation of the IMF, or maybe, due to massive central black holes that would be fossil relicts of UCD progenitor galaxies?

[1] ESO Chile.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

SUBMILLIMETER GALAXY NUMBER COUNTS IN A SEMI-ANALYTIC MODEL: THE "COUNT MATCHING" APPROACH

A. M. Muñoz Arancibia[1], F. P. Navarrete[2,3], N. D. Padilla[1,4], S. A. Cora[5,6], E. Gawiser[7], P. Kurczynski[7], and A. N. Ruiz[8]

Recent interferometric observations of the Extended Chandra Deep Field South show that the brightest sub-millimeter galaxies (SMGs) detected by single-dish telescopes are comprised by emission from multiple fainter sources. With the aim of exploring the properties of SMGs, and in analogy to the now-standard abundance matching approach, we perform a "Count Matching" approach through light-cones drawn from a semi-analytic model. We choose various physical galaxy properties given by the model as proxies for their sub-millimeter fluxes, assuming a monotonic relationship so that the combined LABOCA plus bright-end ALMA observed number counts are reproduced. After turning the catalogs of galaxy positions and fluxes given by the different proxies into sub-millimeter maps, we perform a source extraction. With this we study the effects of the observational process in the recovered counts, as well as the galaxy properties derived from the detected sources for each proxy. Comparing the recovered redshift, stellar mass and host halo mass distributions with observational data, the best proxy can be found.

[1] Instituto de Astrofísica, Pontificia Universidad Católica de Chile, Chile (amunoz@astro.puc.cl).
[2] Argelander-Institut für Astronomie, Germany.
[3] Max-Planck-Institut für Radioastronomie, Germany.
[4] Centro de Astro-Ingeniería, Pontificia Universidad Católica de Chile, Chile.
[5] Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina.
[6] Facultad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata, and Instituto de Astrofísica de La Plata, Argentina.
[7] Department of Physics and Astronomy, Rutgers University, USA.
[8] Observatorio Astronómico de Córdoba, Universidad Nacional de Córdoba, Argentina.

PROPERTIES OF GALAXIES AND GROUPS AT $Z < 1.4$

R. S. Nascimento[1], P. A. A. Lopes[1], and A. L. B. Ribeiro[2]

In this work, we analyze a sample of galaxy groups constructed from the fourth data release of the Deep Extragalactic Evolutionary Probe 2 (DEEP2) including the Extended Groth Strip (EGS). This sample was obtained by Gerke et al. (2012) using the Voronoi-Delaunay Method. We selected 105 galaxy groups with at least 8 members in a radius of 4 Mpc. For each group we estimated its properties such as velocity dispersion (σ), physical radius (R_{200}) and mass (M_{200}). We also classify the groups as Gaussian and non-Gaussian (dynamic evolved or not) based on their galaxy velocity distributions. This classification is based on the following statistical tests: Anderson-Darling, Kolmogorov-Smirnov, Shapiro-Wilk, Jarque-Bera, Cramer-von Mises, D'Agostino and Dip test. When the Dip test confirms the hypothesis of the unimodality and all other tests prove the normality of the system, the group is classified as Gaussian. The behavior of gaussianity was checked varying the distance to the center of the group in 2-4 times its physical radius. Our results show that the number of systems classified as non-Gaussian groups grows with the increase of the physical radius.

[1] Observatório do Valongo, Universidade Federal do Rio de Janeiro, Ladeira Pedro Antônio, 43, Saúde, 20080-090 Rio de Janeiro-RJ, Brasil (rnascimento@astro.ufrj.br).
[2] Laboratório de Astrofísica Teórica e Observacional, Universidade Estadual de Santa Cruz, Rodovia Jorge Amado, Km 16, Salobrinho, 45662-900, Ilhéus-BA, Brasil.

THE DISTRIBUTION OF STELLAR POPULATIONS WITHIN GALAXIES

P. M. Novais[1] and L. Sodré Jr.[1]

The study of stellar populations in galaxies is particularly interesting, since they are a fossil record of several physical processes associated with the formation and evolution of galaxies. In this work we present the first results of our approach to study the

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

spatial distribution of stellar populations inside galaxies. We are using *ugriz* magnitudes and principal component analysis (PCA) to obtain pixel-by-pixel proxies of the stellar populations and their distributions inside each galaxy. The distribution of these populations are then investigated with a variety of statistical tools, including Gini Indices and the Euler-Poincaré characteristic. Our approach aims to be a step forward with respect to the conventional profile fitting, allowing to obtain quantitative estimates on how the different stellar populations are distributed within a galaxy, bringing hints on how galaxies grow and evolve. The pixel-by-pixel analysis of a small sample of 15 galaxies of different types show that the stellar populations tend to evolve from inside to out in spiral and late spiral galaxies, while elliptical galaxies seem to have young stellar populations in the center. This first results show that this approach is effective and will be explored and improve in future works.

[1] Instituto de Astronomia, Geofísica e Cieñcias Atmosféricas, Universidade de São Paulo, Rua do Matão, 1226, Cidade Universitária, São Paulo - SP.

LOW-REDSHIFT COMPACT UV LUMINOUS STARBURSTS: A DOOR TO UNDERSTAND HIGH-REDSHIFT LYMAN-BREAK GALAXIES

C. S. Oliveira[1], K. Menéndez-Delmestre[1], and T. S. Gonçalves[1]

Lyman-break galaxies (LBGs) are a population of distant objects ($z \sim 3$) selected at rest-frame UV that represent the typical starburst galaxy at a time when the universe was going through its peak in star formation activity. The star formation rates of LBGs suggest that these galaxies may be the progenitors of a large part of the massive galaxies in the local universe, making them important objects of study. However, detailed studies of the morphology and kinematics of these distant galaxies are limited by the sensitivity of current instruments. We study a sample of low-redshift UV-selected supercompact starbursts that share many properties (morphology, surface brightness, luminosity) with high-redshift LBGs and are hence denominated as Lyman-break Analogs (LBAs). These UV luminous galaxies (UVLGs) were recently uncovered by the Galaxy Evolution Explorer (GALEX) satellite. At significantly lower redshifts (z 0.2) than LBGs, they provide us with a unique opportunity to draw analogies with their high-redshift counterparts and study in great detail the astrophysical conditions that lead to the star formation activity we observe in the distant universe. We have undertaken the near-IR photometric analysis of a sample of LBAs based on observations taken with the Fourstar instrument on the 6.5m Baade Telescope (Las Campanas Observatory, Chile). We now extend this work to the wider population of compact UVLGs, with surface brightness one or two orders of magnitude than normal galaxies, but less extreme than supercompact UVLGs. Based on J, H, Ks, and optical photometry for 40 compact and supercompact UVLGs we are in the process of analyzing the spectral energy distribution (SED) of each individual galaxy to derive stellar masses and ages in order to explore the similarities and differences between these two populations relative to normal galaxies in the local universe and to LBGs in the distant universe.

[1] Observatório do Valongo/UFRJ, Ladeira Pedro Antônio, 43, CEP 20080-090, Rio de Janeiro, RJ, Brasil (carolyne13@astro.ufrj.br).

AN APPROACH TO MEASURING THE DENSITY OF THE ENVIRONMENT OF GALAXIES: RESULTS AND COMPARISONS WITH OTHER MEASUREMENTS

R. A. Ortega-Minakata[1], J. P. Torres-Papaqui[1], and H. Andernach[1]

With the aim of obtaining a homogeneous and reliable measurement of the density of the environment of a large sample of galaxies, we developed a code that counts the number of neighboring galaxies around a target galaxy. As targets, we selected a large sample of 666,387 galaxies from the spectroscopic catalogue of the SDSS-DR7 with redshifts between 0.03 and 0.30 and more luminous than absolute magnitude of -19 in the SDSS r band. The photometric catalogue of the SDSS-DR7 was used to extract and count the neighboring galaxies from, including about 24M objects, also more luminous than an r-band absolute magnitude of -19, for which a photometric redshift was available to serve as a distance estimate. The code counts all galaxies within an absolute distance of 1.5 Mpc around the target (translated to an apparent radius and a redshift range around that of the target). We avoid galaxies close to the survey edges, leaving 527,074 target galaxies for which we have a measurement of environmental density.

We present our results and compare them to other measurements of the density of the environment of galaxies, such as those in the MaxBCG catalogue of brightest cluster galaxies. As a control of our method, we apply it to a sample of galaxies from the 2MIG catalogue of isolated galaxies, and also to a sample of galaxies from a compilation of members of Abell clusters. We aim to use our results to test the morphology–local density relation and to study the relationship between the different types of emission-line activity of galaxies and their ambient density.

[1] Departamento de Astronomía, Universidad de Guanajuato, 36000, Guanajuato, Mexico (rene,papaqui,heinz@astro.ugto.mx).

GALAXY MODEL IN INFRARED

P. Polido[1] and F. Jablonski[1]

We present in this work a new approach to the derivation of galactic parameters via the star counts method. It uses a modern version of the model of Ortiz & Lépine (1993) and the 2MASS data in J, H and K_S to estimate, based on a regular grid of lines-of-sight over the whole sky, the most important structural parameters of the Galaxy. It is the first time that the star counts method is used in the whole sky, including the complex region of the galactic plane. We have used a conservative approach to derive parameter values and their uncertainties, and also investigate the effects of using several limiting magnitudes over the best set of parameters which describes the Galaxy. Since the landscape for the figure of merit of a model can be pretty complex when we have a number of free parameters in excess of a dozen, the Markov Chain Monte Carlo method looks like ideal for an overview of the parameter space, to constrain regions of interest for further exploration and to provide realistic uncertainties. The pinpointing of the best parameter values is carried out with the Nested Sampling method, very robust in terms of progression to the optimum solution of a multi-parameter model.

[1] Divisão de Astrofísica, Instituto Nacional de Pesquisas Espaciais, Avenida dos Astronautas 1758, 12227-010 São José dos Campos SP, Brazil (pripolido@gmail.com).

BAR AND SPIRAL ARMS DYNAMICS IN NUMERICAL SIMULATIONS

I. Puerari[1] and I. Rodrigues[2]

We present the results of SPH simulations with multi-million particles models. The models were constructed with an exponential disk, Spitzer's isothermal sheet in the vertical direction and a NFW halo. In models having a bulge, a spherical Hernquist profile was used. The models were evolved for approximately 5 Gyr using Gadget 2. We present 1D and 2D Fourier analysis to quantify bar characteristics as length, strength, and pattern speeds. Fourier 2D analysis is also applied to show the effects of the swing amplification mechanism. Indeed, the density waves begin to be amplified as tightly wound leading spirals and unwound to open leading structures. Afterwards, the waves wound into trailing patterns, reach their maximum amplitude and finally, fade away as tightly wound trailing spirals. The timescale for each wave packet is of the order of some 10^8 years.

[1] INAOE, Mexico.
[2] Universidade do Vale do Paraíba, Brazil.

PHYSICAL PARAMETERS OF GALAXIES WITH STAR FORMATION THROUGH MID-INFRARED SED MODELS

A. F. Ramos P.[1], J. R. Martínez-Galarza[2], M. A. Higuera-G.[3], and S. A. Quintero[4]

We present a mid-infrared study of a sample of 19 Starburst galaxies in the local (z<0.2) universe. We derive physical parameters such as Metallicity, Interstellar Medium Pressure, Compactness Parameter C (related to the dust heating flux), PDR Fraction f_{PDR} and Extinction A_V by fitting the Spitzer-IRS spectra of these systems using state-of-the-art radiative transfer models and Bayesian techniques. Our results are fundamental in the understanding of massive star formation in the local counterparts of intermediate and high redshift Ultra Luminous Infrared Galaxies (ULIRGs). We reconstruct the star forming histories of these systems by obtaining posterior probability distribution functions (PDFs) for the star formation rates in different epochs an estimate the contribution to the bolometric luminosity from very recent (< 1 Myr) star formation events, and the contribution of Polycyclic Aromatic Hydrocarbons, which is significant in some cases. By comparing the derived PDFs with particular spectral

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

signatures, such as the nebular emission of atomic species like [NeII] and [NeIII], and the H_2 temperatures we also relate the global pattern of star formation in Starburst galaxies with the internal physics of the ISM.

[1] Departamento de Física, Universidad Nacional de Colombia, Bogotá D.C., Colombia (aframosp@unal.edu.co).
[2] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, MS-51, Cambrigde, MA 02138, USA (jmartine@cfa.harvard.edu).
[3] Observatorio Astronómico Nacional, Universidad Nacional de Colombia, Bogotá D.C., Colombia (mahiguerag@unal.edu.co).
[4] Departamento de Matemáticas, Universidad Nacional de Colombia, Bogotá D.C., Colombia (saquinterov@unal.edu.co).

DISK MASS-TO-LIGHT RATIO THROUGH STELLAR POPULATION SYNTHESIS: DARK MATTER CONTENT OF NGC 5278

P. Repetto[1], E. Martínez-García[2], M. Rosado[3], and R. F. Gabbasov[3]

We extended the study on the mass distribution of the spiral galaxy NGC 5278, obtaining the 2D mass distribution of the stellar disk of NGC 5278 using broad band photometric observations and stellar population synthesis models. We performed the rotation curve (RC) decomposition of NGC 5278, subtracting the extracted baryonic disk from the observed RC and fitting only the dark matter RC with four density profiles of dark matter (DM) halos: Hernquist (HH), Burkert (BH), Navarro, Frenk and White (NFW) and Einasto (EH). The main results of this work were that the HH DM halo better fitted the DM RC of NGC 5278 in the case of disk mass $M_d = 5.6 \times 10^{10} M_\odot$ and less 30% of this value, and also that the cored ($n < 4$) EH DM halo better fitted the DM RC of NGC 5278 in the case of more 30% disk mass.

[1] Laboratorio Nacional de Astrofísica, R. Estados Unidos, 154, Bairro das Nações, 37.504-364 Itajuba , Minas Gerais, Brazil (prepetto@lna.br).
[2] Instituto Nacional de Astrofísica Óptica y Electronica , Luis Enrique Erro 1, Tonantzintla, Puebla, México C.P. 72840.
[3] Instituo de Astronomia, UNAM, Circuito de la Investigación Científica, Ciudad Universitaria, México, D.F., C.P. 04510.

DETERMINATION OF HALO OCCUPATION DISTRIBUTION

F. Rodriguez[1], M. A. Sgró[1], and M. Merchán[1]

In this work, we propose a new method to calculate the Halo Occupation Distribution (HOD). It consist of subtract galaxies that are in front or behind the group (background galaxies), but, for projection effects, seem to belong to this. This allows to combine spectroscopic information from catalogs of galaxy groups with photometric information from catalogs of galaxies, the main advantage of this is the possibility to estimate the HOD in more ranges of absolute magnitudes. To evaluate the procedure, we used mock catalogs of galaxies and groups constructed with an imposed HOD. We compare this fiducial HOD with the obtained results by applying our method. Finally, we implement background subtraction in the Sloan Digital Sky Survey DR7, compare to the results of Yang et al. (2008) and calculate the HOD in other ranges of absolute magnitudes.

[1] Instituto de Astronomía Teórica y Experimental (UNC-CONICET), Observatorio Astroómico de Córdoba. Laprida 854, Córdoba, X500BGR, Argentina (facundo@oac.uncor.edu).

THE DENSE GAS IN M82

P. Salas[1], G. Galaz[1], D. Salter[2], A. Bolatto[2], and R. Herrera-Camus[2]

Galactic winds are responsible of carrying energy and matter from the inner regions of galaxies to the outer regions, even reaching the intergalactic medium. This process removes gas from the inner regions, the available material to form stars. How and in which amount these winds remove gas from galaxies plays an important role in galaxy evolution. To study this effect we have obtained 3 mm maps of dense gas ($n_{\rm crit} > 10^4$ cm^{-3}) in the central region of the starburst galaxy M82. We detect line emission from the dense molecular gas tracers HCN, HCO^+, HNC, CS, HC_3N and C_6H. Our maps reveal a considerable amount of HCO^+ emission extending above and bellow the central star-forming disk, indicating that the dense gas is entangled in the outflow. The mass of molecular Hydrogen outside the central starburst is $M_{\rm out} \approx 3 \pm 1 \times 10^6$ M$_\odot$, while in the central starburst is $M_{\rm disk} \approx 8 \pm 2 \times 10^6$ M$_\odot$. These maps also show variations of the amount of dense gas over the starburst disk, revealing that the gas is more concentrated towards the center of the starburst and less towards the edges. It is the average amount of dense gas what drives the observed star formation law between dense gas and star formation rate on galactic scales.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

[1] Instituto de Astrofísica, Facultad de Física, Pontificia Universidad Católica de Chile, Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile.
[2] Department of Astronomy and Laboratory for Millimeter-Wave Astronomy, University of Maryland, College Park, MD 20742, USA.

PAH LINES AT HIGH REDSHIFT AS GALAXY EVOLUTION MARKER

J. H. B. Santos[1] and A. C. S. Friaça[1]

Based in chemodynamical models for galaxy evolution, we studied the formation of PAH lines at high redshifts. The model considers carbon and silicon grains, and also PAH molecules. It distinguishes diffuse ISM the molecular clouds associated to star forming regions. The PAH lines provide a good signature of the evolutionary stage of galaxies, star formation rate, in addition to allowing the assessment the relative importance for of AGN and stellar emission on the output of the galaxy. In particular, the line ratio 11.3/7.7 μm is a good marker of the age of high redshift galaxies. We expected that our calculations provide some benchmarks both for future observations both with ground and satellite instruments. The ages derived in this way for high redshift objects could be used to test dark energy models. In addition to the cosmological applications, the observations of the PAH features could be used to check the charge state of PAHs. Apparently, anions and neutrals are favored over cations.

[1] Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo, Brazil (jullian.santos@usp.br).

THE MASS–METALLICITY–STAR FORMATION RATE RELATION UNDER THE STARLIGHT MICROSCOPE

M. Schlickmann[1], N. Vale Asari[1], R. Cid Fernandes[1], and G. Stasińska[2]

The correlation between stellar mass and gas-phase oxygen abundance (M–Z relation) has been known for decades. The slope and scatter of this trend is strongly dependent on galaxy evolution: Chemical enrichment in a galaxy is driven by its star formation history, which in turn depends on its secular evolution and interaction with other galaxies and intergalactic gas. In last couple of years, the M–Z relation has been studied as a function of a third parameter: the recent star formation rate (SFR) as calibrated by the Hα luminosity, which traces stars formed in the last 10 Myr. This mass–metallicity–SFR relation has been reported to be very tight. This result puts strong constraints on galaxy evolution models in low and high redshifts, informing which models of infall and outflow of gas are acceptable. We explore the mass–metallicity–SFR relation in light of the SDSS–STARLIGHT database put together by our group. We find that we recover similar results as the ones reported by authors who use the MPA/JHU catalogue. We also present some preliminary results exploring the mass–metallicity–SFR relation in a more detailed fashion: starlight recovers a galaxy's full star formation history, and not only its recent SFR.

[1] Departamento de Física - CFM - Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil.
[2] LUTH, Observatoire de Paris, CNRS, Université Paris Dieterot; Place Jules Janssen, 9210 Meudon, France.

MAGAL: A NEW TOOL TO ANALYSE GALAXIES PHOTOMETRIC DATA

W. Schoenell[1], N. Benítez[1], and R. Cid Fernandes[2]

On galaxy spectra, one can find mainly two features: emission lines, which tell us about the ionised gas content, and the continuum plus absorption lines, which tell us about the stellar content. They thus allow us to derive gas-phase abundances, the main radiation sources, chemical enrichment and star formation histories. Braad-band photometry, on the other hand, is much more limited and hinders our ability to recover a galaxy's physical properties to such a degree of detail. However, with the recent development of redshift surveys using the technology of ultra-narrow filters ($\approx$ 100 Å), such as ALHAMBRA, J-PAS and DES, it will be invaluable to be able to retrieve information on physical properties of galaxies from photometric data.

Motivated by this data avalanche (which goes up to the petabyte scale), we decided to build our own SED-fitting code: Magnitudes Analyser (MgAl), which has three modules. 1) A template library generation module: generates empirical and theoretical template libraries. 2) Bayesian fitting module: calculates probability distribution functions (PDFs) for given observed and library template data. This is

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

similar to the method to measure photometric redshifts by Benitez (2000). 3) A result-analyser module: streamlines data analysis from the large output PDFs files. A fourth module to manage 3D data is being developed and a few preliminary tests are also shown.

To investigate the reliability of results obtained by MagAl, we have created a mock galaxy sample for the ALHAMBRA survey filter system (http://alhambrasurvey.com) and tried to recover their physical properties. We show that for our sample of simulated galaxies we can measure stellar ages, metallicities and extinctions with a precision of less than 0.3 dex. Also, we apply the code to the ALHAMBRA survey catalog and show that we can measure stellar masses with an accuracy of 0.2 dex when comparing to previous results like COSMOS masses measured by Bundy et al. (2006).

[1] Instituto de Astrofísica de Andalucía, Glorieta de la Astronomía, s/n, E-18008, Granada, España, (william@iaa.es).
[2] Universidade Federal de Santa Catarina, Departamento de Física.

A DATA-DRIVEN APPROACH TO THE EMISSION LINE PROPERTIES OF STAR-FORMING GALAXIES

L. Sodre Jr.[1] and A. Albernaz Sirico[1]

We present a quantitative analysis of the correlations between the equivalent widths of optical emission lines for a sample of more than 70,000 star-forming galaxies with high S/N SDSS spectra and with spectral synthesis performed with the Starlight software. We show, using statistical tools such as the distance correlation and maximal information correlation, that there are indeed strong correlations between the most prominent emission lines usually detected in the optical region of galaxy spectra. We have done, also, a Principal Component Analysis (PCA) of the synthesized continuum spectra and used up to 10 components to train an artificial neural network to estimate the equivalent widths of the emission lines, with excellent results, demonstrating that there is a strong correlation between the continuum and equivalent widths. The same analysis was performed with the symbolic regression software Eureqa, which provided functional relations between the four principal components and the equivalent widths, with an accuracy between 0.12 and 0.24 dex for different emission lines. The main motivation behind this work is to produce realistic spectra for tests of data reduction pipelines of the new generation of galaxy surveys, like J-PAS and PFS/SuMIRe.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, R. do Matão 1226, Cidade Universitária, 05508-090, São Paulo, SP, Brazil.

THE NEBULATOM COOKBOOK

G. Stasińska[1] and C. Morisset[2]

We present a series of problems on nebular physics with detailed comments and solutions in python. Their aim is to lead the student to a better understanding of the respective roles of the different processes at play in ionized nebulae, and to use with proper insight some tools that have been developed for the analysis of nebulae. These problems have been proposed at the NEBULATOM workshop in Choroni (Venezuela, 3-16 March 2013), a capacity development workshop for Latin American astronomers on emission-line objects in the Universe. They can be downloaded from https://sites.google.com/site/nebulatomtools/

[1] LUTH, Observatoire de Paris, CNRS, Université Paris Diderot; Place Jules Janssen 92190 Meudon, France (grazyna.stasinska@obspm.fr).
[2] Instituto de Astronomía, Universidad Nacional Autónoma de México, Apdo. Postal 70264, Méx. D.F., 04510 México.

PHYSICAL CONDITIONS OF A HII GALAXY WITH EXTRAORDINARILY DENSE NUCLEUS: MRK996

E. Telles[1], T. X. Thuan[2], Y. I. Izotov[3], and E. R. Carrasco[4]

We present an integral field spectroscopic study with the Gemini Multi-Object Spectrograph (GMOS) of the unusual blue compact dwarf (BCD) galaxy Mrk 996.

We show through velocity and dispersion maps, emission-line intensity and ratio maps, and by a new technique of electron density limit imaging that the ionization properties of different regions in Mrk 996 are correlated with their kinematic properties. From the maps, we can spatially distinguish a very dense high-ionization zone with broad lines in the nuclear region, and a less dense low-ionization zone with narrow lines in the circumnuclear region. Four kinematically distinct systems of lines are identified in

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

the integrated spectrum of Mrk 996, suggesting stellar wind outflows from a population of Wolf-Rayet (WR) stars in the nuclear region, superposed on an underlying rotation pattern. From the intensities of the blue and red bumps, we derive a population of ∼473 late nitrogen (WNL) stars and ∼98 early carbon (WCE) stars in the nucleus of Mrk 996, resulting in a high N(WR)/N(O+WR) of 0.19.

We derive, for the outer narrow-line region, an oxygen abundance 12+log(O/H)=7.94±0.30 (∼ 0.2 $Z_{\odot}$) by using the direct T_e method derived from the detected narrow [O III]λ4363 line. The nucleus of Mrk 996 is, however, nitrogen-enhanced by a factor of ∼20, in agreement with previous CLOUDY modeling. This nitrogen enhancement is probably due to nitrogen-enriched WR ejecta, but also to enhanced nitrogen line emission in a high-density environment. Although we have made use here of two new methods – Principal Component Analysis (PCA) tomography and a method for mapping low- and high-density clouds – to analyze our data, new methodology is needed to further exploit the wealth of information provided by integral field spectroscopy.

[1] Observatório Nacional, Rua José Cristino, 77, Rio de Janeiro, RJ, 20921-400, Brazil, (etelles@on.br).
[2] Astronomy Department, University of Virginia, P.O. Box 400325, Charlottesville, VA 22904, USA, (txt@virginia.edu).
[3] Main Astronomical Observatory, Ukrainian National Academy of Sciences, Zabolotnoho 27, Kyiv, 03680, Ukraine, (izotov@mao.kiev.ua).
[4] Gemini Observatory/AURA, Southern Operations Center, Casilla 603, La Serena, Chile, (rcarrasco@gemini.edu).

THE FORMATION OF STELLAR HALOES OF MASSIVE SPIRALS IN HIERARCHICAL SCENARIO

P. B. Tissera[1,2], T. C. Beers[4], D. Carollo[5], and C. Scannapieco[3]

We investigate the chemical and kinematic properties of the diffuse stellar haloes of six simulated Milky Way-like galaxies from the Aquarius Project. Binding energy criteria are adopted to defined two dynamically distinct stellar populations: the diffuse inner and outer haloes, which comprise different stellar sub-populations with particular chemical and kinematic characteristics. Our simulated inner- and outer-halo stellar populations have received contributions from debris stars (formed in sub-galactic systems while they were outside the virial radius of the main progenitor galaxies) and endo-debris stars (those formed in gas-rich sub-galactic systems inside the dark matter haloes). The inner haloes possess an additional contribution from disc-heated stars in the range $3-30\%$, with a mean of $\sim 20\%$. Disc-heated stars can exhibit signatures of kinematical support, in particular among the youngest ones. Endo-debris plus disc-heated stars define the so-called insitu stellar populations. In both the inner- and outer-halo stellar populations, we detect contributions from stars with moderate to low [alpha/Fe] ratios, mainly associated with the endo-debris or disc-heated subpopulations. The observed abundance gradients in the inner-halo regions are influenced by both the level of chemical enrichment and the relative contributions from each stellar sub-population. Steeper abundance gradients in the inner-halo regions are related to contributions from the disc-heated and endo-debris stars, which tend to be found at lower binding energies than debris stars. In the case of the outer-halo regions, although [Fe/H] gradients are relatively mild, the steeper profiles arise primarily due to contributions from stars formed in more massive satellites, which sink farther into the main halo system, and tend to have higher levels of chemical enrichment and lower energies. Our results show how the abundances of the stars in the stellar haloes vary with radius up to the virial radius and how the characteristics of the metallicity distributions can be linked to the history of assembly within in hierarchical clustering scenario.

[1] Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET, Argentina.
[2] Instituto de Astronomía y Física del Espacio, Casilla de Correos 67, Suc. 28, 1428, Buenos Aires, Argentina.
[3] Max-Planck Institute for Astrophysics, Karl-Schwarzchild Str. 1, D85748, Garching, Germany.
[4] National Optical Astronomy Observatory, Tucson, 85719, USA.
[5] Macquarie University, Dept. Physics & Astronomy, Sydney, 2109 NSW, Australia.

METALLICITY GRADIENTS IN TIDAL TAILS AND MERGING SYSTEMS

S. Torres-Flores[1], S. Scarano Jr[2], D. Olave[1], M. Alfaro[1], C. Mendes de Oliveira[3], D. F. de Mello[4], E. R. Carrasco[5], P. Amram[6], and H. Plana[7]

We present an analysis of the metal distribution in the tidal tails of two interacting systems and in the main body of a galaxy merger: NGC92, NGC6845 and HCG31, respectively. Using Gemini/GMOS

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

spectroscopic data, we found no metallicity gradients for the tail of NGC92. The abundances in the tail are similar to the values displayed by the central regions of NGC92. This fact suggests that gas mixing triggered by the interaction produces a flattening in the metallicity distribution of this system. For the system NGC6845, we found that regions located in the tail have similar abundances to one source located in the inner region of this galaxy, also suggesting a flat metal distribution. For HCG 31 we found an inhomogeneous metal distribution for the central region. Apparently, each star forming complex keeps its metal abundance despite the strong gravitational interaction that this system suffered. In the case of the tidal tails, our results support the scenario in which gas mixing produces a flattening in the metal distribution. However, we suggest that the star formation is an important mechanism in enhancing the oxygen abundance of these structures.

[1] Departamento de Física, Universidad de La Serena, La Serena, Chile (storres@dfuls.cl).
[2] Departamento de Física - CCET, Universidade Federal de Sergipe, São Cristovão, Brazil.
[3] Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo, São Paulo, Brazil.
[4] Catholic University of America, Washington, USA
[5] Gemini Observatory/AURA, Southern Operations Center, La Serena, Chile.
[6] Laboratoire d'Astrophysique de Marseille, Aix Marseille Université, CNRS, Marseille, France
[7] Laboratório de Astrofísica Teórica e Observacional, Universidade Estadual de Santa Cruz, Ilhéus, Brazil.

THE ANDROMEDA GALAXY M31 IN THE ERA OF PRECISION COSMOLOGY

D. Valls-Gabaud[1]

With the advent of precision cosmology, where predictions and measurements can be carried out to a precision level of a few percent, understanding galaxy formation and evolution to the same level of detail appears to be essential for further tests of the paradigm. Here we review recent attempts at (1) understanding the 3-dimensional structure of the satellite system around M31, where half of the dwarfs appear to be orbiting in a vast and thin disc; (2) anchoring M31 very accurately using three independent methods for measuring its distance and hence the Hubble constant; and (3) establishing the variations of star-formation histories across the galaxy through the analysis of the colour-magnitude diagrams of resolved stellar populations.

[1] LERMA, Observatoire de Paris, France.

FIR/RADIO CORRELATION IN COMPACT GROUPS OF GALAXIES

R. R. Vena Valdarenas[1] and C. Valotto[1,2]

We present preliminary results from the statistical analysis of the correlation between the radio and far infrared fluxes in samples of compact groups of galaxies, and isolated galaxies. We use 1.4 GHz fluxes from the NRAO VLA Sky Survey (NVSS) and infrared fluxes at 22 microns from the Wide-field Infrared Survey Explorer (WISE). We show variations on the behavior of this correlation for the different samples. This correlation has been studied by several authors for different samples of isolated galaxies and groups of galaxies.

[1] Instituto de Astronomía Teórica y Experimental, CONICET, Argentina.
[2] Observatorio Astronómico de Córdoba, Universidad Nacional de Córdoba, Argentina.

STELLAR POPULATION PROPERTIES OF POST-STARBURST GALAXIES

A. Werle[1] and A. Mateus[1]

Post-starburst (PSB) galaxies comprise a class of objects with strong traces of young stellar populations in their spectra, but no sign of ongoing star formation. Their star formation histories (SFH) indicate that over 70% of their flux is produced by stellar populations younger than 1.5 Gyr. Samples of PSB galaxies are usually generated by selecting spectra with strong Balmer absorption lines, but no detectable emission lines that characterize star formation (e.g. [OII]λ3727 and Hα). The usual criterion to limit star formation is to limit the equivalent width of the [OII]λ3727 absorption line (Goto el al. 2004). Post-starburst galaxies identified in the Sloan Digital Sky Survey (SDSS) only by requiring minimal [OII]λ3727 emission generally exhibit weak but nonzero emission lines with typical ratios of Active Galaxy Nuclei (AGN) hosts. This suggests that most PSB galaxies may harbor "low-ionization nuclear emission-line regions" (LINERs) and, more rarely, Seyferts (Yan et al. 2008). In this research, we use the STARLIGHT spectral synthesis code (Cid Fernandes et al. 2005) to compute

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

the fraction of light coming from young stellar populations, here denoted by LFYS, in a volume-limited sample from the SDSS DR7 catalog. We then classify as PSB those galaxies with LFYS larger than 70%, log([NII]λ6584/Hα) higher than -0.4 and Hα equivalent width (EW Hα) smaller than 5 Å. These two last criteria select galaxies without current star formation (Cid Fernandes et al. 2011). When plotting this sample in the BPT diagram, we identify a high occurrence of LINER and Seyfert hosts, as found by Yan et al. (2008). However, using the WHAN diagram, we show that most of post-starburst galaxies with low emission lines are in fact passive galaxies, frequently misclassified as weak AGN hosts.

[1] Departamento de Física, Universidade Federal de Santa Catarina, Campus Universitário Reitor João David Ferreira Lima, CEP: 88040-900, Florianópolis, Santa Catarina, Brazil (ariel@astro.ufsc.br).

ACTIVE GALACTIC NUCLEI

ACTIVE GALACTIC NUCLEI

P. Arévalo[1]

Accreting supermassive black holes have had a large impact in the evolution of their host galaxies, and even inject significant energy into their host cluster of galaxies. Although the black hole's influence in these large structures is evident, the central engine itself is remarkably difficult to observe. Their extremely compact nature makes it impossible to resolve the final source of fueling, the accretion disc, although interferometric observations have started to reveal important details of the material directly outside this region. In this work I review the techniques that have shed light into the structure and behavior of these central engines in the quest to find out how black hole grow.

[1] Pontificia Universidad Católica, Chile.

TESTING THE PHYSICAL PROPERTIES OF THE UNIFIED MODEL FOR AGN

A. Audibert[1], R. Riffel[1], M. G. Pastoriza[1], and D. A. Sales[1]

The Unified Model (UM) suggests that different AGN classes are due to the presence of a torus, which under different view angles can obscure the supermassive black hole and the broad line region. We analyze statistically the physical parameters of a sample of about 100 Seyfert galaxies using public data from Spitzer telescope in the mid infrared (5.2-38 μm) in order to verify the UM. We compare the spectral energy distributions (SEDs) with $\sim 10^6$ theoretical SEDs which consider that the torus is formed by dusty clouds and present the results for 8 CLUMPY parameters.

[1] Departamento de Astronomia, Universidade Federal do Rio Grande do Sul, Campus do Vale, Caixa Postal 15051, 91501-970 Porto Alegre, RS, Brasil. (anelise.audibert@ufrgs.br).

TWO-DIMENSIONAL KINEMATICS OF THE CENTRAL REGION OF NGC4501 FROM GMOS/GEMINI INTEGRAL FIELD SPECTROSCOPY

C. Brum[1], R. A. Riffel[1], T. Storchi Bergmann[2], A. Schnorr Muller[2], and A. Robinson[3]

We present two-dimensional stellar and gas kinematics in the central region of the Seyfert 2 galaxy NGC 4501 from optical Integral Field Spectroscopy obtained with Gemini Multi-Object Spectrograph (GMOS) at Gemini-North telescope. The final data cube contains $\sim$16000 spectra covering the inner 7" $\times$ 15" at spatial resolution of $\sim$ 50 pc and covering the spectral region from 5600 Å to 7000 Å at a spectral resolution of 2.7 Å (FWHM). Two-dimensional maps for the flux, velocity and velocity dispersion (σ) were obtained from the fitting of the emission-line profiles of Hα, [N II] $\lambda\lambda$ 6548,6584 and [S II] $\lambda\lambda$ 6717,6731. All lines present extended emission to up to 5" the peak of flux of the nuclear at it. The gas velocity field for all lines are similar, being dominated by rotation in the plane of the galaxy with a velocity amplitude of 100 km^{-1}, although deviations from rotation are seen at some locations. On the far side of the galaxy we observed blueshifts and on the near side redshifts along spiral structures, being interpreted as inflows towards the nucleus of NGC 4501. The forbidden lines show σ values ranging from 50 to 150 km s^{-1} while the Hα shows overall smaller values, with the highest ones reaching $\sim$ 100 km s^{-1}. The highest σ values for all emission lines are observed at 2-3 arcsec northeast from the nucleus, being co-spatial with a distortion seen in the

velocity field. The electron density map obtained from the [SII] $\lambda\lambda$ 6731/6716 line ratio shows values between 100 cm^{-3} the nucleus to 900 cm^{-3} in a ring of high densities.

[1] Universidade Federal de Santa Maria, Departamento de Física/CCNE, 97105-900, Santa Maria, RS, Brasil (carine.fisica@gmail.com).
[2] Universidade Federal do Rio Grande do Sul, Instituto de Física, CP 15051, Porto Alegre 91501-970, RS, Brasil).
[3] Rochester Institute of Technology, 54 Lomb Memorial Drive Rochester, NY 14623 USA.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

MORPHOLOGY AND ABSOLUTE MAGNITUDES OF THE SDSS DR7 QSOs

B. Coelho[1], A. H. Andrei[1,2,3,4], and S. Antón[5,6]

The ESA mission Gaia will furnish a complete census of the Milky Way, delivering astrometrics, dynamics, and astrophysics information for 1 billion stars. Operating in all-sky repeated survey mode, Gaia will also provide measurements of extra-galactic objects. Among the later there will be at least 500,000 QSOs that will be used to build the reference frame upon which the several independent observations will be combined and interpreted. Not all the QSOs are equally suited to fulfill this role of fundamental, fiducial grid-points. Brightness, morphology, and variability define the astrometric error budget for each object. We made use of 3 morphological parameters based on the PSF sharpness, circularity and gaussianity, which enable us to distinguish the "real point-like" QSOs. These parameters are being explored on the spectroscopically certified QSOs of the SDSS DR7, to compare the performance against other morphology classification schemes, as well as to derive properties of the host galaxy. We present a new method, based on the Gaia quasar database, to derive absolute magnitudes, on the SDSS filters domain. The method can be extrapolated all over the optical window, including the Gaia filters. We discuss colors derived from SDSS apparent magnitudes and colors based on absolute magnitudes that we obtained tanking into account corrections for dust extinction, either intergalactic or from the QSO host, and for the Lyman α forest. In the future we want to further discuss properties of the host galaxies, comparing for e.g. the obtained morphological classification with the color, the apparent and absolute magnitudes, and the redshift distributions.

[1] Observatório do Valongo, Universidade Federal do Rio de Janeiro, Ladeira Pedro Antônio, 43, CEP 20080–090, Rio de Janeiro – RJ, Brazil (bcoelho@astro.ufrj.br).
[2] Observatório Nacional/MCTI, Rio de Janeiro, Brazil.
[3] SYRTE/Observatoire de Paris, Paris, France.
[4] CAR/University of Hertfordshire, Hatfield, UK.
[5] CICGE/Faculdade de Ciências da Universidade do Porto, Porto, Portugal.
[6] SIM/Faculdade de Ciências da Universidade de Lisboa, Lisbon, Portugal.

KINEMATICS AND EXCITATION OF THE NUCLEAR SPIRAL IN THE ACTIVE GALAXY ARP 102B

G. S. Couto[1], T. Storchi-Bergmann[1], D. J. Axon[2], A. Robinson[2], P. Kharb[3], and R. A. Riffel[1,4]

We present a two-dimensional analysis of the gaseous excitation and kinematics of the inner $2.5 \times 1.7\,\mathrm{kpc}^2$ of the LINER/Seyfert 1 galaxy Arp 102B, from optical spectra obtained with the GMOS integral field spectrograph on the Gemini North telescope at a spatial resolution of $\approx$ 250 pc. Emission-line flux maps show the same two-armed nuclear spiral we have discovered in previous observations with the HST-ACS camera. One arm reaches 1 kpc to the east and the other 500 pc to the west, with a 8.4 GHz VLA bent radio jet correlating with the former. Gas excitation along the arms is low, with line ratios typical of LINERs. The gas density is highest at the nucleus and in the northern border of the east arm, at a region where the radio jet seems to be deflected. Centroid velocity maps suggest that most gas is in rotation in an inclined disk with line of nodes along position angle $\approx 88°$, redshifts to the west and blueshifts to the east, with lower blueshifts correlated with the eastern arm and radio jet. This correlation suggests that the jet is interacting with gas in the disk. Channel maps show blueshifts but also some redshifts at the eastern arm and jet location which can be interpreted as originated in the front and back walls of an outflow pushed by the radio jet, suggesting also that the outflow is launched close to the plane of the sky. We propose a scenario in which gas has been recently captured by Arp 102B in an interaction with Arp 102A, settling in a disk rotating around the nucleus of Arp 102B and triggering its nuclear activity. A nuclear jet is pushing the circumnuclear gas, giving origin to the nuclear arms.

[1] Universidade Federal do Rio Grande do Sul, IF, CP 15051, Porto Alegre 91501-970, RS, Brazil.
[2] Physics Department, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623, USA.
[3] Indian Institute of Astrophysics, 2nd Block, Koramangala, Bangalore 560034, India.
[4] Universidade Federal de Santa Maria, Departamento de Física, Centro de Ciências Naturais e Exatas, 97105-900, Santa Maria, RS, Brazil.

TWO-DIMENSIONAL KINEMATICS OF THE CENTRAL REGION OF NGC 2110

M. R. Diniz[1], R. A. Riffel[1], and T. Storchi-Bergmann[2]

We present a two-dimensional mapping of the central region of the active galaxy NGC 2110, using K-band integral field spectroscopy with the Gemini NIFS at a spatial resolution of ≈ 25 pc. We present flux distributions and kinematics for the molecular and ionized gas emission lines, as well as the stellar kinematics. The maps for the kinematics and flux distributions of the emitting gas for NGC 2110 were obtained by fitting the $H_2\,\lambda\,2.1218\,\mu$m and H I $\lambda\,2.1661\,\mu$m emission-line profiles by Gauss-Hermite series. The H_2 presents extended emission in the whole field of observation, while the Brγ is extended only to the southeast – northwest direction. The H_2 emission is consistent with emission of gas excited by thermal processes, such as gas heated by X-rays from the AGN or shocks. We estimated an excitation temperature of $\approx 2100 - 2700$ K for H_2 emitting gas. The gas velocity fields present a similar rotation pattern than those observed for the stars. In addition, the H_2 velocity field presents other kinematic components. Two spiral structures are observed in blueshifts to the north of the nucleus and redshifts to the south of it. If these kinematic structures are originated from emission of gas located in the plane of the galaxy, they can be interpreted as gas flows towards the nucleus (inflows) of the galaxy. In this case, the mass inflow rate is estimated to be $\approx 4.1 \times 10^{-4}\,M_\odot\,yr^{-1}$. Another kinematic component observed for H_2 emitting gas was interpreted as an ejection of gas from the nucleus (outflows) within a bi-cone with a mass outflow rate of $\approx 4.6 \times 10^{-4}\,M_\odot\,yr^{-1}$.

[1] Universidade Federal de Santa Maria - UFSM, Fone: +55 55 3220 8000, Av. Roraima, 1000, Cidade Universitária, Bairro Camobi, CEP 97105-900, Santa Maria, RS, Brasil.
[2] Departamento de Astronomia IF-UFRGS, Fone: +55 51 3308 6439, Av. Bento Gonçalves 9500, Caixa Postal 15051, CEP 91501-970, Porto Alegre, RS, Brasil.

UNVEILING THE LINER NATURE OF NGC1052

S. I. F. Diniz[1], M. G. Pastoriza[1], R. Riffel[1], R. A. Riffel[2], M. R. Diniz[2], and T. Storchi-Bergmann[1]

NGC 1052 is an E4 galaxy and classified as a typical LINER harboring a stellar rotating disk. However, the central region is spectroscopically unusual with broad optical emission lines, the nature of its emission line gas remains unclear. According to recent studies NGC 1052 exhibit Hα luminosities an order of magnitude above that estimated for an evolved population of extreme horizontal branch stars. Their Hα equivalent widths and optical-to-near infrared (NIR) spectral energy distributions are consistent with them being young stellar clusters aged < 7 Myr, and according to previous works, NGC 1052 may have experienced a merger event about 1 Gyr ago. There are mainly three possibilities to explain LINER's spectra: i) post asymptotic giant branch stars (post-AGB) that ionize their rapidly expanding shells, (ii) active galactic nuclei (AGNs) powered by the in fall of matter into an accretion disk, and (iii) shocks. The stellar population (SP) of AGNs shows an excess of intermediate age stars. Besides, NIR stellar population studies have revealed that the continuum of active galaxies is dominated by the contribution of intermediate age stellar populations. Hot dust emission unresolved is also commonly detected in NIR nuclear spectra of galaxies Seyfert and LINERs. Aimed to discriminate the dominant ionizing source of NGC 1052 we present preliminary results of high spatial resolution integral field spectroscopy, taken with gemini NIFS to map the dominant stellar population, as well as disentangling the featureless and hot dust components.

[1] Departamento de Astronomia, Universidade Federal do Rio Grande do Sul.
[2] Departamento de Física/CCNE, Universidade Federal de Santa Maria.

GAP FORMATION IN CIRCUMBINARY AGN DISKS

A. Escala[1] and L. Del Valle[1]

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

We numerically study the formation of gaps in circumbinary disks of comparable mass massive black hole binaries ($q \sim 1$). We vary the disk properties (mass, thermodynamics, etc.) and found that most massive and thicker disks are able to prevent the gap formation in them. We contrast our results against analytical models based on the non-axisymetric perturbation enhanced in the disk, which succesfully predicts the disks that opens a gap. We discuss the implications for the occurence of opened and failed gaps in the final separations and posible merging of binary AGNs.

[1] Universidad de Chile.

A NUCLEAR MOLECULAR RING IN MRK1066 REVEALED BY PCA TOMOGRAPHY

M. G. Hennig[1], R. A. Riffel[1], and T. Storchi-Bergmann[2]

We used the PCA (Principal Component Analysis) tomography technique to analyze J and K band datacubes for the inner $\approx$ 350 pc radius of the Seyfert 2 galaxy Mrk 1066, obtained with the Gemini/NIFS (Near-Infrared Integral-Field Spectrograph) at a spatial resolution of $\approx$ 35 pc. The first eigenvector is dominated by emission from the AGN and host galaxy and corresponds to 95% of the variance of the data. The second eigenvector for the K band presents an anti-correlation between the blue and red wavelengths. In corresponding tomogram, it is observed that the nuclear emission is dominated by red part, and thus we interpret this eigenvector as being due the emission of the dusty torus. A rotating disk is observed in eigenspectrum 2 (in J band) and eigenspectrum 3 (in K band) and their respective tomograms. Correlations among line and radio emission are observed for the next eigenspectrum. Double line profiles are seen in the eigenvector 3 (for the J band) and 4 (K band), probably originated by the interaction of the radio jet with the line-emitting gas. The analysis of the fifth eigenspectrum for the K band and its tomogram shows that the H_2 emission concentrated in two spiral arms originated from a nuclear ring of molecular hydrogen (with radius of ~ 0.2") surrounding the nucleus of the galaxy ring and extend to up to 1.5" from the nucleus to northeast and to southwest. This structure was hot seen in the "traditional" analysis of the cube.

[1] Universidade Federal de Santa Maria, Avenida Roraima, 1000 cidade universitária bairro camobi Santa Maria RS Cep 97105-900 Brasil.
[2] Universidade Federal do Rio Grande do Sul - Campus do Vale. Avenida Bento Goncalves, 9500 Protasio Alves, Porto Alegre RS Cep 91509-900, Brasil.

PHYSICAL PROPERTIES OF FEII EMISSION IN ACTIVE GALACTIC NUCLEI

M. A. O. Marinello[1], A. Rodríguez-Ardila[2], and A. Garcia-Rissmann[3]

Among the spectral lines emitted by the broad line region (BLR) in active galactic nuclei (AGN) the FeII emission is the most prominent one and therefore constitutes one of the most important contributors to the cooling of that region. In the near infrared (NIR) the FeII emission is intense but free of blending effects opening a window to a more consistent analysis of that emission. With the aim of studying the FeII in the range 0.8-1.2 μm in a sample of 21 AGNs we utilize a semi-empirical template obtained from IZw1, which is considered the prototype of FeII active galaxy emitter. That particular template reproduces accurately the FeII in IZw1 and it is now applied, by the first time in other AGNs. In this work we made a analysis of the width and intensity of the FeII lines in order to derive the most probable location of the emitting region and to study the formation mechanisms of that ion, respectively. We compare the width of the individual FeII lines with that of other lines emitted in BLR. Our results show that the FWHM of iron systematically approaches to that of OI and CaII and is considerably smaller than that of Hydrogen, confirming previous assumptions that the gas responsible for the FeII emission is the outer portion of the BLR. We correlate the strength of the NIR and optical iron lines to derive the relative contribution of the different mechanisms that produces that emission. We found that in all cases the Lyα fluorescence plays an important role.

[1] Universidade Federal de Itajubá.
[2] Laboratório Nacional de Astrofísica.
[3] European Southern Observatory.

THE ARCHITECTURE OF THE ACTIVE GALACTIC NUCLEUS OF NGC 1068

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

D. May[1], J. Steiner[1], R. B. Menezes[1], and T. V. Ricci[1]

NGC 1068 is the brightest and most studied AGN in the sky. Its study motivated the development of the Unified Model for AGN as the prototype of an obscured Seyfert 1 galaxy. The opportunity of studying such object, with IFU spectrographs in the near infrared, allow us to understand the details of how gas is being fed to the central black hole and how the gas is being ionized and ejected from the center. We re-analyzed data taken from the SINFONI (VLT) and NIFS (GEMINI North) public archives, in the HK bands with spatial resolution of 0,1 arcsec (1,7 pc/spaxel). We concentrated our analysis on the molecular H2 lines, the low ionization line [Fe II] and the high ionization line [Si VI]. The analysis shows very distinct behavior for the different lines. In particular we found a clear structure resembling a "glowing-hourglass" shape for the low velocity [Fe II] emission, while the high velocity emission fills the "hourglass". The shape of this image suggests that the dusty torus and the ionization axis, possibly associated to the central accretion disk, are not co-planar. The primary wind is probably originated from this asymmetry while the secondary wind is likely to be originated from an H2 emitting cloud, about 1" to the north of the AGN, impacted by the primary wind and ionized by the central source.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas da USP, Rua do Matão, 1226 - Cidade Universitária São Paulo-SP - Brasil - 05508-090, (dmay@usp.br).

THE ROLE OF AGN FEEDBACK IN THE EVOLUTION OF SEYFERT GALAXIES

F. Mueller-Sanchez[1], M. Malkan[1], E. Hicks[2], and R. Davies[3]

Adaptive optics integral-field observations of Seyfert Galaxies have recently revealed clear evidence of AGN-driven outflows of ionized gas. By resolving the inner 10–20 parsecs, we are successfully modeling the geometry and kinematics of the outflows in 3D. The model parameters are used to estimate mechanical feedback from the AGN and test unification models. The mass outflow rates are 2–3 orders of magnitude greater than the accretion rates, but they are comparable to the estimated inflow rates to the central 10–25 pc, suggesting that the outflows may remove a considerable amount of the infalling gas before it reaches the accretion disk. The outflows seem to form two distinct groups which differ by outflow power variations with radio flux. While powerful outflows (with kinetic powers > 1.0% Lbol) are observed in objects with extended radio jets, in the other AGN – in which the outflow power is less than 0.1% Lbol – the radio jet is weak and compact.

[1] University of California Los Angeles.
[2] University of Washington.
[3] MPE, Germany.

PROBING AGN ACCRETION THROUGH GRAVITATIONAL MICROLENSINGS OF QSOS

D. Neri-Larios[1], R. Webster[1], and D. Floyd[1]

Understanding QSO accretion is both at the frontier of new physics, and essential in understanding the driving force behind the great power of QSOs and their energetic feedback onto their galactic environments. However, the accretion disks are at micro-to-nano arcsecond scales, unresolvable from Earth. Gravitational microlensing of QSOs provides statistical information on the microarcsecond structure of the lensed QSO. By measuring the flux ratio in two of the lensed images and comparing to a lens models for the intervening galaxy, I intend to establish upper limits on the size of the emission region.

[1] School of Physics, The University of Melbourne, Parkville, Vic. 3010, Australia (danielnl@student.unimelb.edu.au).

CHARACTERIZING THE CONTINUUM IN NARROW LINE SEYFERT 1 GALAXIES

G. A. Oio[1,2], L. Vega Neme[1,3], E. Schmidt[1,4], and D. Ferreiro[1,3]

Narrow Line Seyfert 1 (NLS1) active galactic nuclei (AGN) are a subclass of AGN with Seyfert 1 characteristics but without prominent broad lines. In this work we approach the determination of the non-stellar continuum using the spectral synthesis technique. We chose a sample of 130 NLS1 available in the Sloan Digital Sky Survey (SDSS). This sample comprehend all the objects of such class catalogued on the local universe (z<0.1). With this method we determined (a) central black hole masses, (b) accretion rates, (c) electronic densities in the narrow line region. We found and analyzed possible relations between this parameters.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

[1] Instituto de Astronomía Teórica y Experimental (IATE) - Córdoba, Argentina.
[2] Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET).
[3] Observatorio Astronómico Córdoba - Córdoba, Argentina.
[4] Secretaría de Ciencia y Técnica (SECYT - UNC).

DIAGNOSTIC DIAGRAM WITH POLYCYCLIC AROMATIC HYDROCARBONS IN DIFFERENT TYPES OF GALAXIES

S. A. Quintero[1], A. F. Ramos P.[2], M.A. Higuera-G.[3], J. R. Martínez-Galarza[4]

In this contribution, we investigate the energetic processes associated to star formation activity in galaxies. In this way, spectroscopic data was used to discriminate those processes in a sample of starburst, luminous infrared galaxies-LIRGs, ultraluminous infrared galaxies-ULIRGs, and also in Seyfert, quasars and radio galaxies. We propose a new diagnostic diagram based on the polycyclic aromatic hydrocarbon features. The diagnostic diagram allow us to discriminate the behavior of starbursts and LIRGs-ULIRGs objects, taking into account the line emission of the PAHs, [NeII], [NeIII], and [OIV]. We found a good relation between [NeII] and PAH (11.2μm+11.3μm) in starburst, LINER and Seyfert samples.

[1] Department of Mathematics, National University of Colombia, Bogotá D.C., Colombia.
[2] Department of Physics, National University of Colombia, Bogotá D.C., Colombia.
[3] National Astronomical Observatory, National University of Colombia, Bogotá D.C., Colombia.
[4] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, MS-51, Cambrigde, MA 02138, USA.

MOLECULAR HYDROGEN AND [FE II] IN AGNS AND STAR FORMING GALAXIES

R. Riffel[1], A. Rodríguez-Ardila[2], I. Aleman[1], M. S. Brotherton[3], M. G. Pastoriza[1], C. Bonatto[1], and O. Dors[4]

We study the kinematics and excitation mechanisms of molecular hydrogen and [Fe II] lines in a sample of 67 emission-line galaxies with Infrared Telescope Facility SpeX near-infrared (NIR) spectroscopy together with new photoionisation models, in the wavelength interval between 0.8μm and 2.4μm. H_2 emission lines are systematically narrower than narrow-line region (NLR) lines, suggesting that both are, very likely, kinematically disconnected. The new models and emission-line ratios show that the thermal excitation plays an important role not only in active galactic nuclei but also in star forming galaxies. The importance of the thermal excitation in star forming galaxies may be associated with the presence of supernova remnants close to the region emitting H_2 lines. This hypothesis is further supported by the similarity between the vibrational and rotational temperatures of H_2. We confirm that the diagram involving the line ratios H_2 2.121μm /Brγ and [Fe II] 1.257μm /Paβ is an efficient tool for separating emission-line objects according to their dominant type of activity. New limits to the line ratios, are suggested, in order to discriminate between the different types of nuclear activity.

[1] Departamento de Astronomia, Universidade Federal do Rio Grande do Sul - Av. Bento Gonçalves 9500, Porto Alegre, RS, Brasil.
[2] Laboratório Nacional de Astrofísica/MCT - Rua dos Estados Unidos 154, Bairro das Nacões. CEP 37504-364, Itajubá, MG, Brasil.
[3] Department of Physics and Astronomy, University of Wyoming, Laramie, WY 82071, USA.
[4] Universidade do Vale do Paraíba - Av. Shishima Hifumi 2911, Cep 12244-000, São José dos Campos, SP, Brasil.

NUCLEAR OUTFLOWS IN THE SEYFERT 2 GALAXY NGC 5929

R. A. Riffel[1], T. Storchi-Bergmann[2], and R. Riffel[2]

We present two-dimensional (2D) near-infrared spectra of the inner $3'' \times 3''$ of the Seyfert 2 galaxy NGC 5929 at a spatial resolution of $\sim$20 pc obtained with the Gemini NIFS. We report the discovery of a linear structure $\sim$ 300 pc in extent and of $\sim$ 50 pc in width oriented perpendicular to the radio jet, showing broadened emission-line profiles. While over most of the field the emission-line profiles have full-widths-at -half-maximum (FWHM) of $\approx$200km s^{-1}, at the linear structure perpendicular do the radio jet the emission-line FWHMs are twice this value, and are due to two velocity components, one blueshifted and the other redshifted relative to the systemic velocity. We attribute these velocities to an outflow from the nucleus which is launched perpendicular

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

to the radio jet. This means that: (1) both ionizing radiation and relativistic particles are escaping through holes in the torus perpendicular to the radio jet; and/or (2) the torus is also outflowing, as proposed by recent models of tori as winds from the outer parts of an accretion flow; or (3) the torus is absent in NGC 5929.

[1] Universidade Federal de Santa Maria, Departamento de Física, CCNE, 97105-900, Santa Maria, RS, Brazil. (rogemar @ufsm.br).
[2] Universidade Federal do Rio Grande do Sul, IF, CP 15051, Porto Alegre 91501-970, RS, Brazil.

CHROMATIC MICROLENSING IN HE0047-1756 AND SDSS1155+6346

K. Rojas[1], V. Motta[1], E. Mediavilla[2], E. Falco[3], and J. A. Muñoz[4]

The gravitational lens effect occurs when the light is deflected in the presence of a gravitational field, generating multiple images or arcs. Microlensing happens when a compact object, in the lens galaxy halo, passes across a quasar lensed image.

We analyzed two double systems: HE0047-1756 and SDSS1155+6346. We used spectra obtained with Magellan/IMACS (2007) and MMT/BlueChannel (2008). The flux of emission line cores was separated from the continuum flux under them and integrated using DIPSO software. Comparing the magnitude differences in the emission line cores with the magnitude differences in the continuum under the lines (Motta et. al 2012), we found evidence of chromatic microlensing in HE0047-1756 and SDSS1155+6346.

Emission line core fluxes are used to model the systems with *lensmodel*. SIS + γ are the best models in both cases, which are in agreement with literature. SDSS1155+6346 model shows a large shear, due to the presence of MaxBCG J178.81693+63.83446 cluster.

We follow Mediavilla et al. 2011, modeling the accretion disk as a Gaussian intensity profile $I(R) \propto \exp(-R^2/2r_s^2)$, with $r_s(\lambda) \propto \lambda^p$, where r_s is the accretion disk size and p is the power law related to the temperature of the disk $p = 1/\beta$. We estimate the probability of r_s and p using the measured microlensing magnification with linear and logarithmic priors on r_s. We found within 1σ of uncertainty, sizes between 3 and 15 light days and temperature profiles values between 1 and 1.2. These values are in agreement with the literature and Shakura & Sunyaev (1973) prediction.

We acknowledge to FONDECYT 1120741 and Centro de Astrofísica, Universidad de Valparaíso.

[1] Instituto de Física y Astronomía, Facultad de Ciencias, Universidad de Valparaíso.
[2] Instituto de Astrofísica de Canarias.
[3] Harvard-Smithonian Center for Astrophysics.
[4] Departameto de Astronomía y Astrofísica, Universidad de Valencia.

CHARACTERIZING THE ENVIRONMENT OF THE BLAZARS PG1553+113 AND 3C66A FROM GEMINI-GMOS DATA IN THE I' AND G' BANDS

J. Torres Zafra[1,2], S. A. Scellone[1,2], and I. Andruchow[1,2]

Blazars are active galactic nuclei (AGNs) which, because of their particular orientation with respect to the observer, are characterized by beamed electromagnetic emission from a relativistic jet. It is thus challenging to detect either continuum or line radiation from the nucleus or from the host galaxy; in many cases this prevents the measurement of a spectroscopic redshift. However, the analysis of their environments may give valuable information, considering that galaxies in the blazar's field could share physical and chemical properties with the host galaxy, besides having a similar redshift. We have thus undertaken a photometric study of the galaxies in the fields of the blazars PG1553+113 and 3C66A, based on g' and i' images taken with the GMOS instrument (multi-object spectrograph and camera) at Gemini North 8m telescope. Our goal is to look for concentrations of galaxies around both blazars in order to have a first knowledge of the general characteristics of their immediate environments.

[1] Instituto de Astrofísica de La Plata.
[2] Universidad Nacional de La plata-Argentina.

FHILS IN SEYFERTS AND LINERS IN THE OPTICAL SPECTRA

R. J. C. Vera[1,2], A. M. Rodríguez[1,3], and J. G. Portilla[1,4]

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

We present the main results from a selection of optical spectra of Seyfert and LINER galaxies taken from the 9^{th} release of the SDSS with detectable emission of forbidden high ionization lines (FHILs), better known as coronal lines. A catalog of 345 Seyfert 1 (Sy1) and Seyfert 2 (Sy2) galaxies with FHILs emission is presented. By analyzing their spectra and utilizing data from the literature we found the following results: (1) The flux ratios between FHILs suggests anisotropy of emission between Sy1 and Sy2 galaxies, which agrees with the results found by Nagao et al. (2002) and Portilla (2012). Sy1 seems to emit more FHILs than Sy2. (2) This anisotropy suggests the idea that an important, but not the majority, of the emission of FHILs comes from the inner part of the obscuring torus. (3) We present diagnostic diagrams between FHILs lines which indicate clear correlations between the flux ratios. (4) It is observed that the ratio of Ne V/Fe VII is of the order of 3 to 10, while the ratios between iron lines (i.e., Fe VII, Fe X, Fe XI) are roughly around the unity. (5) At least in the optical spectra, the present study continues to support the general idea that LINERs are not energetic enough to present FHILs. A complete version of this study including the catalog with the objects of study, and diagnosis diagrams using only this kind of lines can be found in Vera & Portilla (in prep).

[1] Observatorio Astronómico Nacional, Universidad Nacional de Colombia Carrera 45 No 26-85, Bogotá DC, Colombia.
[2] rjverar@bt.unal.edu.co
[3] anamrodriguezv@unal.edu.co
[4] jgportillab@unal.edu.co

HIGH ENERGY ASTROPHYSICS

DECAY OF MAGNETIC FIELD IN BLACK WIDOW PULSARS

C. M. Castilho[1], O. G. Benvenuto[2], M. A. De Vito[2], and J. E. Horvath[1]

A small fraction of the binary relativistic systems display the "black widow" effect: the companion is being ablated by the (recycled) pulsar wind. In these binary systems the evolution of the companion star (of the solar-type) reaches the point of filling its Roche lobe, thus initiating the process of mass accretion onto the pulsar. Accretion is generally believed to result in magnetic field decay, while isolated neutron star fields decay very slowly, if at all. We shall show that the very long evolution of the "black widow" system, starting from a solar-type star and lasting > 5 Gyr to reach the observed position in the plane, allows us to conclude that the magnetic field does not decay below the bottom value , extending the previous conclusions drawn from younger systems. In addition, the masses of the "black widow" pulsars are naturally predicted to be > 2 Mo due to the accretion history, in full agreement with recent measurements.

[1] Instituto de Astronomia, Geofísica e Ciências Atmosféricas da Universidade de São Paulo.
[2] Faculdad de Ciencias Astronómicas y Geofísicas, Universidad Nacional de La Plata.

RADIATION-HYDRODYNAMIC MODEL OF HIGH-MASS X-RAY BINARIES

J. Čechura[1,2] and P. Hadrava[1]

The topic of circumstellar matter in the X-ray binaries and its spectroscopic diagnostics is addressed by method of generating synthetic Dopplerograms for direct comparison with observations. The presented results were obtained using our improved three-dimensional radiation-hydrodynamic model of the stellar wind in HMXBs. We use the model to simulate dynamics, anisotropy and other characteristics of the wind, e.g. the density distribution and ionization structure. We adopt parameters of Cygnus X-1 in our simulations and use the Doppler tomography to probe the structure of radiation-emitting material in the system. We introduce a data interpretation method of observed Doppler tomograms via direct comparison with synthetic Dopplerograms obtained from our model. We test the reliability of the model as well as set constrains on various physical parameters and processes, e.g. the accretion rate. We take into account the Coriolis force, the ionization structure of the medium, the gravity darkening, and we investigate the effects these phenomena have on the accretion process. E.g. the Coriolis force substantially influences the mass-loss of the donor and by that the accretion rate of the compact companion. Additionally, focusing of the stellar wind by the gravitational field of the compact companion leads to the formation of an unstable gaseous tail behind the companion. This tail shows signs of quasi-periodic oscillations and its existence presents us with other means to explain the switching mechanism among the various X-ray states.

[1] Astronomical Institute, Academy of Scientitlehe Czech Republic, Boční II 1401, 141 31 Prague, Czech Republic.
[2] Faculty of Mathematics and Physics, Charles University in Prague, Ke Karlovu 3, 121 16 Prague, Czech Republic.

RUNAWAY MASSIVE STARS AS A NEW CLASS OF GALACTIC GAMMA-RAY SOURCES

M. V. del Valle[1] and G. E. Romero[1]

Runaway stars have high spatial velocities, $V > 30$ km s^{-1}, and if the are massive, can produce bow-shocks in the surrounding ISM. These bowshocks develop as arc-shaped structures pointing in the same direction as the supersonic stellar velocity. The piled-up shocked matter emits thermal radiation. Additionally, a population of locally accelerated relativistic particles can produce non-thermal emission over a wide range of energies. This has been recently confirmed by a bunch of observations at radio, X-ray and even gamma-ray wavelengths. Runaway early-type stars might be variable gamma-ray sources, with variability time scales depending on the scales of density inhomogeneities in the medium and the stellar velocity. Protons can easily escape from the emitting region without much loss on energy. These protons might diffuse in the surrounding molecular cloud interacting with the matter via p-p inelastic collisions. These yield gamma rays and secondary particles. Molecular clouds illuminated by these relativistic particles might become into diffuse non-thermal sources. We calculate all relevant non-thermal processes related to these stellar objects and discuss the observational prospects.

[1] Instituto Argentino de Radioastronomia (IAR).

THE GALACTIC DISTRIBUTION OF FERMI POINT SOURCES

F. Jablonski[1] and P. Polido[1]

The second catalog of high-energy γ-ray sources detected by the Large Area Telescope (LAT), the primary science instrument on the *Fermi Gamma-ray Space Telescope*, allows us for the first time to perform a modeling of the galactic distribution of such sources based on the method of summing up all detectable sources in a grid of lines of sight. The challenge is to produce reliable estimates of counts from small numbers. The catalog contains 1873 sources over the whole sky, giving an average of 0.036 counts/deg^2 for $|b| > 60°$. In a narrow strip centered at $|b| < 0.5°$ we find 128 sources. In this work, we describe our attempts to estimate the density of γ-ray sources along both galactic longitude and galactic latitude. The results of the estimated source counts are compared with the predictions of a model which has an exponential distribution in the radial direction as well as an exponential distribution above the galactic plane. Our conclusions point to a radial length scale consistent with that obtained from near-infrared counts and a very short height scale, typical of very young populations in the Galaxy. We tested both Gaussian and Power-Law forms for the luminosity function. The luminosities cover the range $10^{33} - 10^{36}$ erg/s in the 100 MeV–100 GeV band with space densities (in the solar neighborhood) of $\sim 10^{-8}$/pc^3.

[1] Instituto Nacional de Pesquisas Espaciais/MCTI, Astrophys Division, (f.jablonski@inpe.br).

A MAGNETIC RECONNECTION MODEL FOR EXPLAINING MICROQUASARS RADIATION

B. Khiali[1], E. M. de Gouveia Dal Pino[1], M. V. del Valle[2], and H. Sol[3]

Very high energy observations of AGNs and microquasars are challenging current theories of particle acceleration (mostly based on shock acceleration) which have to explain how particles are accelerated to energies above TeV in very compact regions compared to the characteristic scales of their sources. The identification of microquasars and AGNs as sites of particle acceleration raises many fascinating and important questions. Recent magneto-hydrodynamical studies have revealed that cosmic ray acceleration by fast magnetic reconnection can be rather efficient because a first-order Fermi process may occur. In this work, we discuss this acceleration mechanism in the coronal region of the accretion disk around microquasars and AGNs. In addition, the accelerated particles lose substantial amounts of their energy due to non-thermal interactions with the surrounding magnetic field, matter and radiation fields. We compute the corresponding acceleration rate and the relevant loss rates in order to reproduce the observed spectral energy distribution for two microquasars (Cygnus-X1, Cygnus-

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

X3), considering the model above and leptonic and hadronic processes.

[1] University of Sao Paulo (IAG-USP, Brazil), (bkhiali@usp.br).
[2] IAR, CONICET, Argentina.
[3] Observatoire de Meudon, France.

HIGHLIGHTS ON γCAS-LIKE STARS

E. M. Ribeiro[1], R. Lopes de Oliveira[2,1], and R. Dupke[1]

The number of Be stars with unusually hard-thermal and variable X-ray emission like that of γ-Cassiopeiae increased from one to ten in seven years. It is possible that they could be progenitors of magnetars or account for the missing number of Be/WD binaries observed, and this can be further tested through careful characterization of the parameter space in which the X-ray emission occurs. Here, we present a compendium of the optical and X-ray properties of a sample of this new class of X-ray emitters and some very recent results presented by our group. We discuss the current understanding and emphasize results that strengthen the interpretation of magnetic activities near the Be star as being the source of the X-ray emission.

[1] Coordenação de Astronomia e Astrofísica (COAA) - Observatório Nacional (ON) - Ministério da Ciência, Tecnologia e Inovação (MCTI), Rio de Janeiro, Rio de Janeiro, Brasil.
[2] Universidade Federal de Sergipe (UFS), São Cristóvão, Sergipe, Brasil.

PROPERTIES OF GALAXY GROUPS SELECTED FROM CHANDRA X-RAY OBSERVATIONS OF THE BOÖTES FIELD

B. Vajgel[1,2], P. A. A. Lopes[1], C. Jones[2], W. R. Forman[2], and S. S. Murray[2]

Galaxy groups are not simply scaled down versions of rich clusters (e.g. Mulchaey 2000, Voit 2005). Due to a group's shallow gravitational potential, feedback processes play an important role in the group's evolution. It is important to understand galaxy groups since, in hierarchical clustering, they are the building blocks of large scale structure. Thus, in addition to determining the characteristics of groups, it is important to determine the mass function over the range that includes poor clusters and groups. We present the properties of the galaxy groups selected in the Chandra X-Boötes survey (Kenter et al. 2005). Group redshifts are measured from the AGES (Kochanek et al. 2012) spectroscopic data. We use photometric data from the NOAO Deep Wide Field Survey (NDWFS) (Jannuzi & Dey 1999) to estimate the group richness (N_{gals}) and the optical luminosity (L_{opt}). Our final sample comprises 32 systems at $z < 0.80$, with 14 below $z = 0.35$. For these systems we estimate velocity dispersions (σ_{gr}) and perform a virial analysis to obtain the radius (R_{200} and R_{500}) and mass (M_{200} and M_{500}) for groups with at least five galaxy members. We use the Chandra X-ray observations to derive the X-ray luminosity (L_X). We examine the performance of the group properties σ_{gr}, L_{opt} and L_X, as proxies for the group mass. Understanding how these observables measure the total mass is important to estimate how well the cluster/group mass function is determined. By extending the mass function to the group regime, we predict the number of groups that new X-ray surveys, eROSITA, will detect.

[1] Observatório do Valongo, Universidade Federal do Rio de Janeiro, (bvajgel@astro.ufrj.bv).
[2] Harvard-Smithsonian Center for Astrophysics.

COSMOLOGY

GAUSSIAN ANALYSES ON PLANCK CMB MAPS

A. Bernui[1]

Extremely precise cosmic background radiation (CMB) data from *Planck* satellite confirmed the cosmological model ΛCDM and established tight constraints for several features of the primary and secondary CMB temperature fluctuations. Possible non-Gaussian (NG) contributions to the CMB field could be originated during (or soon after) primordial cosmic inflation, where the types, scale dependences, and intensities expected depend on the inflationary models. For this, the robust detection –or not– of primordial NG in the CMB signify a unique probe to the early universe, allowing to distinguish between competing models. Recent analyses from *Planck* CMB data strongly limit the level of NG and show consistency with the Gaussian hypothesis although they do not exclude the presence of weak Gaussian deviations. A problem inherent with the confidence of a positive detection is the possibility that any non-primordial contamination could be

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

mixed with primary contributions leading to qualitative and/or quantitative imprecise detections.

A variety of methods are being used to search for different NG signals in CMB data because one does not expect that a single statistical tool can be able to identify all possible forms of Gaussian deviations. Using two directional large-angle NG indicators based on skewness and kurtosis statistical momenta of patches of the CMB sphere, we analyze the three nearly full sky foreground-cleaned *Planck* maps: SMICA, NILC, and SEVEM.

Our results show that these foreground-cleaned *Planck* maps exhibit different levels of NG at large angles, depending on the cut-sky mask used (all of them released by the *Planck collaboration*). The separation component minimum mask, termed M82, and the U73 mask appear to be equally efficient to Gaussianize all these CMB *Planck* maps.

[1] Observatório Nacional, MCTI.

CENTRAL DOMINANT GALAXIES AND THE EVOLUTION OF THEIR HOST CLUSTERS

C. A. Caretta[1], H. Andernach[1], J. J. Trejo-Alonso[1], J. de Anda-Suárez[2], H. Santoyo-Ruiz[2], M. A. Muñiz-Torres[2], and C. Hernández-Aguayo[2]

We have studied a sample of 50 galaxy clusters, all with more than 100 spectroscopically confirmed member galaxies, from all Bautz-Morgan types, in order to determine the importance of the brightest cluster members (BCMs) and their relation to the structure and dynamical state of their host clusters. Strict tests for membership and for the presence of substructures were applied. Near-infrared data were used for photometry and astrometry, which allowed us to rank the member galaxies in order of their stellar mass content. The large spectroscopic sampling, the broad range of morphologies, masses and intra-cluster medium properties, beyond the improved analyses for membership and substructuring, make this sample an especially suitable reference of nearby optical clusters ($0.005 < z < 0.150$) for the study of cluster evolution and environment effects on member galaxies. Only 35% of the clusters revealed to be unimodal, 50% to be substructured and other 15% to be multi-modal. Also, for about 20% of the sample, the Central Dominant Galaxy (CDG) of the main structure is not the first-ranked BCM, but the CDG of a substructure. More massive clusters present more than one dominant galaxy, while the less massive ones present only one, if any. This correlation goes in the sense that most of the evolution of CDGs occurs in groups that are doomed to merge and form clusters.

[1] Departamento de Astronomía, DCNE-CGT, Universidad de Guanajuato; Callejón de Jalisco, S/N, Col. Valenciana, 36240, Guanajuato, Gto., Mexico (caretta,heinz,josue@astro.ugto.mx).
[2] Departamento de Física, DCI-CLE, Universidad de Guanajuato; Loma del Bosque, 103, Col. Lomas del Campestre, 37150, León, Gto., Mexico.

NEW CATALOGUES OF SUPERCLUSTERS OF ABELL/ACO GALAXY CLUSTERS UP TO $z \sim 0.15$

M. Chow Martínez[1], H. Andernach[1], and C. A. Caretta[1]

We present two new catalogues of superclusters of galaxies within a redshift of $z = 0.15$, constructed using the Abell/ACO cluster redshift compilation by one of us (H.A.). One is the all-sky Main SuperCluster Catalogue (MSCC), based on 3410 A-clusters (92% with spectroscopic redshifts), containing 601 superclusters with multiplicities from 2 to 42; the other is the Southern ($\delta < -17°$) SuperCluster Catalogue (SSCC) based on 1227 A-clusters and 1177 S-clusters (90% with spectroscopic redshifts), containing 425 superclusters with multiplicities from 2 to 39. These are currently the deepest all-sky supercluster catalogues based on optical data. By comparing both catalogues, we found the following effects (expressed as percentages of the total number of superclusters in SSCC): new superclusters with S-clusters around A-cluster cores (12.6%), the formation of bridges of S-clusters between A-clusters (1.2%), and the addition of new superclusters formed by S-clusters only (25.4%). We determined morphological parameters for the superclusters, based on ellipsoid fits and Minkowski functionals, obtaining that 39% of the rich (multiplicity >5) superclusters are prolate ellipsoids and 61% are oblate ones. The cumulative multiplicity functions of both catalogues follow very closely a power law with an exponent of −2.0 for MSCC and −1.9 for SSCC. This power law is clearly inconsistent with the same function we derived for supercluster catalogues based on simulated samples of randomly distributed clusters. It is also inconsistent, though less significantly, with similar analyses we applied to the Bolshoi cosmological sim-

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

ulation of the evolution of the large-scale structure of the universe.

[1] Departamento de Astronomía, Universidad de Guanajuato, Callejón de Jalisco S/N, Valenciana, 36240, Guanajuato, Guanajuato, México. (marcel@astro.ugto.mx, heinz@astro.ugto.mx, caretta@astro.ugto.mx).

HUGE-LQG- THE LARGEST STRUCTURE IN THE UNIVERSE

R. G. Clowes[1], S. Raghunathan[2], K. A. Harris[3], L. E. Campusano[2], I. K. Sochting[4], and M. J. Graham[5]

A large quasar group (LQG) of particularly large size and high membership has been identified in the DR7QSO catalogue of the Sloan Digital Sky Survey. It has characteristic size ($volume^{1/3}$) $\sim$ 500 Mpc (proper size, present epoch), longest dimension $\sim$ 1240 Mpc, membership of 73 quasars and mean redshift z=1.27. In terms of both size and membership, it is the most extreme LQG found in the DR7QSO catalog for the redshift range $1.0 < z < 1.8$ of our current investigation. Its location on the sky is $\sim$ 8.8 degrees north ($\sim$ 615 Mpc projected) of the Clowes & Campusano LQG at the same redshift, $z = 1.28$, which is itself one of the more extreme examples. This new, Huge-LQG appears to be the largest structure currently known in the early Universe. Its size suggests incompatibility with the Yadav et al. (2010) scale of homogeneity for the concordance cosmology, and thus challenges the assumption of the cosmological principle.

[1] Jeremiah Horrocks Institute, University of Central Lancashire, UK.
[2] Departamento de Astronomía, Universidad de Chile, Santiago, Chile.
[3] Department of Physics, Virginia Tech, Blacksburg, VA.
[4] Astrophysics, Denys wilkinson Building, Keble Road, University of Oxford, UK.
[5] California Institute of Technology, Pasadena, CA.

SUPER-MASSIVE BLACK HOLE GROWTH IN THE FIRST GIGAYEAR OF COSMIC HISTORY

J. E. Forero-Romero[1], M. F. Gomez-Alvarez[1], and S. Velasco-Moreno

As two galaxies collide the super-massive black holes in their centers will merge. The resulting black hole will be ejected with a certain kick velocity. The black hole will move in the galaxy's potential well while it oscillates and returns to its initial position due to dynamic friction processes. In this work we use semi-analytic techniques to follow the amount of mass accreted by the BH since the initial kick until its return to a stationary position at the center of the host galaxy. We focus our study on black holes in the mass range $10^6 - 10^9$ Msun. We use these results to re-interpret the observational constraints on the growth of super-massive black holes during the first gigayear of cosmic history.

[1] Departamento de Física, Universidad de los Andes, Cra. 1 No. 18A-10, Edificio Ip, Bogotá, Colombia.

CONTRASTING DISTANCES USING TYPE IA SUPERNOVAE AND GAMMA RAY EVENTS IN THE LOCAL UNIVERSE

R. Girola[1]

In the year 1998, it is discovered -through Type Ia supernova observation- that the universe is expanding at an accelerating rate. One interpretation, which is not contrary to General Relativity, accepts the existence of a cosmological constant other than zero and of Quintessence, a repulsive force. These supernovae are used as standard candles to measure both distances and the accelerating expansion rate of the universe. Although this is based on well-known and proven facts, it was found that the method employed contains systematic errors. The purpose of this study is to present an alternative method to reduce the errors through the measurement of galactic distances, using gamma-ray events from gamma-ray binaries and microquasars. As the actual supernova population is rather small to be statistically reliable, it is supported with numerical simulations to provide a contrast between Type Ia supernovae and gamma-ray events. To this end, we apply the measurement of Type Ia supernovae to nearby galaxies where is possible to measure the accelerating expansion of the universe. Afterwards, assuming that the observations and instrumentations would enable this possibility, we perform the measurements of a group of microquasars, taking on account their approximate equitable distribution of energy which is contrary to the results of supernovae. Our study remains open to further exploration on whether there is a difference between the distances measured or they are compatible and they manage to minimize the systematic

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

error of Type Ia supernova method. In this way, we estimate if the distances are consistent in each case as well as we calculate the measurement of the universe's expansion.

[1] Universidad Nacional de Tres de Febrero. Argentina.

COSMOLOGY FROM THE ANGULAR CORRELATION FUNCTION AND GALAXY CLUSTERS

M. Lima[1], H. Camacho, M. Aguena, and DES-Brazil consortium

The large-scale clustering properties of galaxies allows us to investigate models which attempt to explain the recent acceleration of the Universe background expansion. These properties include the correlations of galaxies and the abundance of galaxy clusters. I will present some of the relevant aspects when using these probes to constrain cosmological models. If time allows I will also present some of our recent results on real data from the Sloan Digital Sky Survey DR8 and on mock catalogs of the Dark Energy Survey.

[1] Instituto de Física, Universidade de São Paulo.

THE GALAXY COSMOLOGICAL MASS FUNCTION

A. R. Lopes[1], A. Iribarrem[1], M. B. Ribeiro[2], and W. R. Stoeger[3]

The aim of this work is to present a semi-empirical relativistic approach which uses the general model connecting cosmological theory to observational data derived from galaxy surveys (Ribeiro & Stoeger 2003, ApJ, 592, 1) to study the galactic mass evolution. For this purpose we define a new quantity named the galaxy cosmological mass function (GCMF). We used the FORS Deep Field survey sample of 5558 galaxies in the redshift range $0.5 < z < 5.0$ and its luminosity function in the B-band, as well as this sample's stellar masses. We obtained that the GCMF behaves as a power-law given by $\zeta(z) \propto [\mathcal{M}_g(z)]^{-2.3\pm0.4}$, where $\mathcal{M}_g$ is the average galactic mass in the studied redshift interval. This result can be seen as an average of the galaxy stellar mass function pattern found in the literature, where more massive galaxies were assembled earlier than less massive ones.

[1] Observatório do Valongo, Universidade Federal do Rio de Janeiro, Ladeira Pedro Antônio, 43, 20080-090, Rio de Janeiro, RJ, Brazil (amanda05@astro.ufrj.br).
[2] Instituto de Física, Universidade Federal do Rio de Janeiro, Brazil.
[3] Vatican Observatory Research Group, Steward Observatory, University of Arizona, USA.

THE CFHT/MEGACAM STRIPE-82 SURVEY

B. Moraes[1], J.-P. Kneib[2], A. Leauthaud[3], M. Makler[1], L. Van Waerbeke[4], K. Bundy[3], T. Erben[5], C. Heymans[6], H. Hildebrandt[4,5], L. Miller[7], H. Y. Shan[8,9], D. Woods[4], A. Charbonnier[1], and M. E. Pereira[1]

The CFTH/MegaCam Stripe-82 Survey (CS82) is a joint Canada-France-Brazil project covering $\sim$ 170 sq. deg. in the SDSS Stripe-82 area down to magnitude 24.1 in the optical i-band with a mean 0.6" seeing (PIs: J.-P. Kneib, A. Leauthaud, M. Makler, L. Van Waerbeke). Its main focus is the study of weak and strong gravitational lensing, with additional applications in other fields such as galaxy evolution and galaxy cluster science. Furthermore, the multitude of existing and future projects in Stripe-82, covering from the radio to the UV and including a large set of spectroscopic data, offers the possibility of exploring applications in many fields of astronomy, thereby enhancing the scientific value of the survey. In this Short Talk, we will give an overview of the main published and ongoing CS82 scientific projects. They include the measurement of the largest contiguous lensing convergence map to date and its peak statistics, providing direct information on the large scale dark matter distribution; the first CMB-lensing × shear cross-correlation measurement, probing the dark matter distribution at redshifts of order 1; galaxy-galaxy lensing measurements around SDSS-III/BOSS galaxies, constraining halo occupation distribution (HOD) models and obtaining complementary mass measurements in combination with BOSS spectroscopic data; the discovery of several new gravitational arc systems and more.

[1] ICRA, Centro Brasileiro de Pesquisas Físicas.
[2] Laboratoire d'Astrophysique de Marseille, Aix Marseille Université.
[3] Institute for the Physics and Mathematics of the Universe, University of Tokyo.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

[4] Department of Physics and Astronomy, University of British Columbia.
[5] Argelander Institute for Astronomy, University of Bonn.
[6] Scottish Universities Physics Alliance, Institute for Astronomy, University of Edinburgh, Royal Observatory.
[7] Department of Physics, Oxford University.
[8] Laboratoire d'astrophysique, Ecole Polytechnique Fédérale de Lausanne.
[9] Department of Physics and Tsinghua Center for Astrophysics, Tsinghua University.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

HALO-BASED RECONSTRUCTION OF THE COSMIC MASS DENSITY FIELD

J. C. Muñoz-Cuartas[1], V. Müller[2], and J. E. Forero-Romero[3]

We present the implementation of a halo-based method for the reconstruction of the cosmic mass density field. The method employs the mass density distribution of dark matter haloes and its environments computed from cosmological N-body simulations and convolves it with a halo catalogue to reconstruct the dark matter density field determined by the distribution of haloes. We applied the method to the group catalogue of Yang et al. built from the Sloan Digital Sky Survey (SDSS) Data Release 7. As a result we obtain reconstructions of the cosmic mass density field that are independent of any explicit assumption of bias. We describe in detail the implementation of the method, present a detailed characterization of the reconstructed density field (mean mass density distribution, correlation function and counts in cells) and the results of the classification of large-scale environments (filaments, voids, peaks and sheets) in our reconstruction. Applications of the method include morphological studies of the galaxy population on large scales and the realization of constrained simulations.

[1] Instituto de Fisica, Universidad de Antioquia, Medellin, Colombia.
[2] Leibniz-Institut für Astrophysik Potsdam.
[3] Departamento de Fisica, Universidad de los Andes, Bogota, Colombia.

OBSERVATIONAL CONSTRAINTS ON A COUPLED QUINTESSENCE MODEL WITH A GENERALIZED DE EOS

R. C. Nunes[1] and E. M. Barboza Jr[1]

In this work we put constraints on a quintessence dark energy model that interacts with the dark matter fluid. By assuming a DE model described by the parameterization $w(a) = w_0 + w_1 \ln_\beta(a)$ and that the dark fluids follows the relation $\rho_m/\rho_x = a^{-\xi}$ we use the most recent data of SN Ia, BAO, CMB and H(z) to put constraints on the EoS parameters w_0, w_1 and $\Omega_{m,0}$ for selected values of β and ξ parameters. Although the standard ΛCDM model is in good agreement with our results, we show that scenarios with interaction in the dark sector can not be ruled out by currently available data.

[1] Universidade do Estado do Rio Grande do Norte.

GRAVITATIONAL WAVES AND STABILITY OF COSMOLOGICAL SOLUTIONS IN THE MODIFIED STAROBINSKY INFLATION

A. M. Pelinson[1], J. C. Fabris[2], F. O. Salles[3], and I. L. Shapiro [3]

We consider the dynamics of metric perturbations in the gravity theory with anomaly-induced quantum corrections. Our first purpose is to derive the equation for gravitational wave in this theory on the most general homogeneous and isotropic background, and then explore the stability of such background with respect to metric perturbations. Our first purpose is to explore the stability of the classical cosmological solutions in the theory with quantum effects taken into account. There is an interesting literature about stability of Minkowski and de Sitter spaces and here we extend the consideration also to the radiation and matter dominated cosmologies. The consideration was based on explicit derivation of gravitational wave equations in the theory with anomaly-induced quantum corrections and on the use of both analytical and numerical methods to perform the detailed analysis of these equations. The main conclusion of our work is that the stability conditions are essentially related to the sign of the Weyl-squared term in the *classical* action of vacuum and do not manifest any essential dependence on the quantum contributions. Furthermore, we analyze the behavior of metric perturbations during inflationary period, in the stable phase of the Modified Starobinsky inflation.

[1] Departamento de Física, CFM/Universidade Federal de Santa Catarina, Brazil.
[2] Departamento de Física, CCE/ Universidade Federal de Vitória.

[3] Departamento de Física, ICE/Universidade Federal de Juiz de Fora, Brazil.

MEASURING GALAXY MORPHOLOGIES IN THE CFHT STRIPE 82 SURVEY

M. E. S. Pereira[1], A. Charbonnier[1,2], B. Moraes[1], M. Makler[1], E. Bertin[3], and R. Pereira[1]

We present the determination of galaxy structural parameters in the CFHT Stripe 82 Survey (CS82) stacked images. The CS82 survey covered an area of ~ 170 square degrees with the CFHT $3.6m$ telescope in a field determined by $-40 < RA < 45$ and $-1 < DEC < 1$ (within the SDSS stripe-82 region) in i-band to a depth of $mag_{AB} \sim 24$. Its excellent image quality (mean seeing of ~ 0.6) and uniformity makes CS82 specially suitable for applications involving gravitational lensing and galaxy morphology. The determination of galaxy structural parameters has applications to galaxy evolution studies, weak lensing, and the improvement of the photometry in other surveys (e.g. SDSS), through the "forced photometry" method. The morphological analysis of galaxies is performed through a profile-fitting method implemented with a combination of SExtractor v2.14.7 (which has model-fitting features) and PSFEx. First, we use SExtractor to perform the detection and obtain basic measurements of objects, then we use PSFEx to model the PSF across the field, and finally, we run SExtractor again to perform the model-fitting of objects. In particular we use 4 models implemented in SExtractor: Sérsic, de Vaucouleurs, exponential and 2-component de Vaucouleurs+exponential. In this work we outline the procedure described above and focus on a quality assessment of the determination of the ellipticities, through a comparison with the CS82 weak lensing catalogue obtained with the state-of-the-art code lensfit (Miller et al. 2007).

[1] Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro, Brazil (mariaeli@cbpf.br).
[2] Observatório do Valongo, Rio de Janeiro, Brazil.
[3] Institut d'Astrophysique de Paris, Paris, France.

IDENTIFICATION AND EXTRACTION OF PHOTOMETRIC REDSHIFTS OF QUASARS WITH NARROW-BAND FILTERS

C. Queiroz[1] and L. Raul Abramo[1]

Although quasars are valuable targets for many cosmological applications, imaging surveys employing optical broad-band filter systems are unable to obtain accurate photometric redshifts for these objects. Broad-band imaging surveys also have some difficulty in distinguishing quasars from stars and HII regions of galaxies. However, the construction of a high-purity catalog of quasars, with accurate photometric redshifts, can be much more efficient with medium or narrow-band surveys, such as the upcoming J-PAS. In this work we discuss how to overcome the degeneracies in the color-color and color-magnitude diagrams that hamper the efficient detection of quasars, and how to obtain very good (near spectroscopic) photometric redshifts for these objects. In particular, we discuss how to include quasars in some of the most popular redshift codes, and the parallel need for the inclusion of spectral libraries for stars. We also discuss the importance of a good modeling of the distribution of point-sources in the sky, and the need for reliable luminosity functions that can inform the Bayesian estimation of types and photometric redshifts.

[1] Dep. de Física Matemática, Instituto de Física, Universidade de São Paulo, Rua do Matão 187, CEP 05508-090 São Paulo, SP, Brazil (cqueiroz@if.usp.br).

GRAVITATIONAL WAVES FORMULATION FOR THE BRANE UNIVERSE AND POSSIBLE INDUCED CORRECTIONS ON AN OBSERVATIONAL LEVEL

C. D. Rodríguez-Camargo[1] and E. A. Larrañaga-Rubio[2]

The observation of gravitational waves and their effect on different physical systems constitute one of most searched for proofs of the theory of general relativity. In this work, a brief summation on their construction based on general relativity and its observational consequences is presented with the intention of later extending the analysis to obtain the wave equation from the field equations that describe the brane universe. With the obtained results, a discussion is opened around the possibility of distinguishing observationally between general relativity and the brane universe theory. Since brane theory considers that gravity can spread to the extra dimensions (thus appearing weaker than the rest of interactions), it is possible to argue that the expected amplitude of gravitational waves according to the theory differs from the one expected in relativity.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

In the same way, it is to expect that the effect of energy dissipation that involves gravitational waves emission, as occurs in binary systems, needs to be corrected.

[1] Departamento de Física, Universidad Nacional de Colombia, Campus Bogotá, Bogotá, Colombia (cdrodriguezc@unal.edu.co).
[2] Observatorio Astronómico Nacional, Universidad Nacional de Colombia, Campus Bogotá, Bogotá, Colombia (ealarranaga@unal.edu.co).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

ANISOTROPIC HALO MODEL

M. A. Sgró[1], D. J. Paz[1], M. E. Merchán[1], and F. Rodriguez[1]

We present an extended version of the classic halo model for the large-scale matter distribution which includes a triaxial model for the halo density profiles, a probabilistic distribution of the halo shape and a probabilistic law describing the alignment of the surrounding structure. In particular, we derive general expressions for the halo-matter cross-correlation function. Using a Monte Carlo integration method we obtain instances of the cross-correlation function depending on the directions given by halo shape axes. These functions are called anisotropic cross-correlations. We have found that our model is able to reproduce the numerical measurements of those functions over a wide range of scales, particularly in the 2-halo regime. The parameters of the model obtained by fitting numerical results recover the well known mass dependence of halo shapes and the alignment of dark matter halos with the surrounding structure. In this sense, most massive halos tend to have a less spherical shape and more prolate mass profile. In addition, we have found that taking the triaxial nature of dark matter halos into account improves at least %15 the predictions of the standard halo model (as noted by others authors before).
Finally, we are working on the development of a similar model in order to compare theoretical predictions with anisotropic correlation functions measured on galaxy group catalogues. These results will appear in a forthcoming paper.

[1] Instituto de Astronomía Teórica y Experimental, CONICET-UNC, Laprida 854, Córdoba, Argentina. (marioagustin@oac.uncor.edu).

THE TYPE IA SUPERNOVA PIPELINE FOR THE JAVALAMBRE PHYSICS OF THE ACCELERATING UNIVERSE ASTROPHYSICAL SURVEY (J-PAS)

B. B. Siffert[1], R. R. R. Reis[1], and M. O. Calvão[1]

The Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is an astronomical facility being built in Sierra de Javalambre, Spain. The main goal is to study the expansion of the Universe through different cosmological observables such as baryonic acoustic oscillations, type Ia supernovae and galaxy clusters. The main instrument will be a 2.5 m telescope equipped with a system of 56 narrow band filters in the optical. Here we present a sketch of the pipeline we are developing to detect type Ia supernovae with J-PAS. First we describe each individual step of the pipeline, such as image subtraction and source selection. Then we show some results we obtained when applying our pipeline to images from the Sloan Digital Sky Survey and the ALHAMBRA survey, which had a set of narrow band filters similar to the ones that will be used by J-PAS.

[1] Instituto de Física, Universidade Federal do Rio de Janeiro, Av. Athos da Silveira Ramos, 149, 21941-972, Rio de Janeiro, Brazil (beatriz@if.ufrj.br).

THE RED SEQUENCE OF AXU CLUSTERS

J. J. Trejo-Alonso[1,2], C. A. Caretta[1], T. F. Laganá[2,3], L. Sodré Jr.[2], E. Cypriano[2], G. B. Lima Neto[2], and C. Mendes de Oliveira[2]

We present an analysis of the colour-magnitude relation for a sample of 54 Abell X-ray underluminous (AXU) clusters aiming at unveiling properties that may elucidate the evolutionary stages of the galaxy populations which compose such systems. We compared the parameters of their colour-magnitude relations with the ones found for another sample of 50 Abell X-ray "normal" (AXN) emitting clusters. The g and r magnitudes from the SDSS-DR7 were used for constructing the colour-magnitude relations.

We found that both samples show the same trend: the red sequence slopes change with redshift, but the slopes for AXU clusters are always flatter than AXN clusters, by a difference of about 42% along the surveyed redshift range of $0.05 \leq z < 0.20$. Also, the intrinsic scatter of the colour-magnitude relation was found to grow with redshift for both samples, but for the AXU clusters, this is systematically

larger by about 31%. When we subdivide the AXU clusters in two subsamples, one with significant and the other with little or no substructure, we find that the former shows red-sequence slopes that are significantly flatter than those for the latter. This points to AXU clusters being younger systems than normal clusters, possibly accreting groups of galaxies, individual galaxies and gas.

[1] Departamento de Astronomía, Universidad de Guanajuato, Callejón de Jalisco S/N, Valenciana, 36240, Guanajuato, Guanajuato, México. (josue@astro.ugto.mx).
[2] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, Rua do Matão 1226, Cidade Universitária, CEP:05508-090, São Paulo, SP, Brasil.
[3] Núcleo de Astrofísica Teórica, Universidade Cruzeiro do Sul, Rua Galvão Bueno 686, Liberdade, CEP: 01506-000, São Paulo, SP, Brasil.

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

PROPERTIES OF TYPE IA SUPERNOVAE INSIDE RICH GALAXY CLUSTERS

H. S. Xavier[1,2], R. R. Gupta, M. Sako, C. B. D'Andrea, J. A. Frieman, L. Galbany, P. M. Garnavich, J. Marriner, R. C. Nichol, M. D. Olmstead, D. P. Schneider, and M. Smith

We used the GMBCG galaxy cluster catalogue and SDSS–II supernovae data with redshifts measured by the BOSS project to identify 48 SNe Ia residing in rich galaxy clusters and compare their properties with 1015 SNe Ia in the field. Their light curves were parametrised by the SALT2 model and the significance of the observed differences was assessed by a resampling technique. To test our samples and methods, we first looked for known differences between SNe Ia residing in active and passive galaxies. We confirm that passive galaxies host SNe Ia with smaller stretch, weaker colour–luminosity relation [β of 2.54(22) against 3.35(14)], and that are ~ 0.1 mag more luminous after stretch and colour corrections. We show that only 0.02 per cent of random samples drawn from our set of SNe Ia in active galaxies can reach these values. Reported differences in the Hubble residuals scatter could not be detected, possibly due to the exclusion of outliers. We then show that, while most field and cluster SNe Ia properties are compatible at the current level, their stretch distributions are different ($\sim 3\sigma$): besides having a higher concentration of passive galaxies than the field, the cluster's passive galaxies host SNe Ia with an average stretch even smaller than those in field passive galaxies (at 95 per cent confidence). We argue that the older age of passive galaxies in clusters is responsible for this effect since, as we show, old passive galaxies host SNe Ia with smaller stretch than young passive galaxies ($\sim 4\sigma$).

[1] Instituto de Fisica, Universidade de Sao Paulo, Sao Paulo, SP, Brazil.
[2] Department of Physics & Astronomy, University of Pennsylvania, Philadelphia, PA, USA.

INSTRUMENTATION

BOMBOLO: A MULTI-BAND, WIDE-FIELD, NEAR UV/OPTICAL IMAGER FOR THE SOAR 4M TELESCOPE

R. Angeloni[1,2,3], D. Guzmán[1], T. H. Puzia[2], and L. Infante[1,2]

BOMBOLO is a new multi-passband visitor instrument for SOAR observatory. The first fully Chilean instrument of its kind, it is a three-arms imager covering the near-UV and optical wavelengths. The three arms work simultaneously and independently, providing synchronized imaging capability for rapid astronomical events. BOMBOLO will be able to address largely unexplored events in the minute-to-second timescales, with the following leading science cases: 1) Simultaneous Multiband Flickering Studies of Accretion Phenomena; 2) Near UV/Optical Diagnostics of Stellar Evolutionary Phases; 3) Exoplanetary Transits and 4) Microlensing Follow-Up. BOMBOLO optical design consists of a wide field collimator feeding two dychroics at 390 and 550 nm. Each arm encompasses a camera, filter wheel and a science CCD230-42, imaging a 7 x 7 arcmin field of view onto a 2k x 2k image. The three CCDs will have different coatings to optimise the efficiencies of each camera. The detector controller to run the three cameras will be Torrent (the NOAO open-source system) and a PanView application will run the instrument and produce the data-cubes. The instrument is at Conceptual Design stage, having been approved by the SOAR Board of Directors as a visitor instrument in 2012 and having been granted full funding from CONICYT, the Chilean State Agency of Research, in 2013. The Design Phase is starting now and will be completed in late 2014, followed by a construction phase in 2015 and 2016A, with expected Commissioning in 2016B and 2017A.

[1] Centro de Astro-Ingeniería, Pontificia Universidad Católica de Chile, Santiago, Chile.

[2] Instituto de Astrofísica, Pontificia Universidad Católica de Chile, Santiago, Chile.
[3] Max-Planck-Institut für Astronomie, Heidelberg, Germany.

ATMOSPHERIC TURBULENCE SIMULATIONS WITH SPATIAL LIGHT MODULATORS

R. Bernardi[1], A. Kanaan[1], and A. Mello[1]

Atmospheric turbulence in the optical path of incoming stellar light transforms a plane wavefront into a distorted wavefront. This leads to loss of resolution achievable in a telescope. The correction of these distortions is the goal of adaptive optics. We are designing an experiment to recreate the effects of turbulence on an optical bench. This experiment aims to reproduce the effects observed in an artificial sodium laser star when viewed by a 30m class telescope. The edge of such large telescopes see the sodium artificial star as an elongated rather than a circle. In the bench experiment the turbulence distortions are achieved by directing the light beam through a glass plate whose surface is etched to imitate the phase distortions caused by the atmosphere, this plate is called a phase screen. Phase screens are made much bigger than the incident beam of light and we move this phase plate to simulate the effect of a changing atmosphere. To test new turbulence patterns one needs several different phase screens, which are expensive and hard to make. Our work involves computing numerical simulations of turbulence and testing algorithms to correct the phase distortion.We would then like to test these algorithms on our bench before testing on the telescope. To make these tests more realistic we would like to apply the same simulated turbulence patterns to our phase screen. This is almost impossible to do with phase screens, therefore we are planning to replace phase screens with spatial phase modulators that can be programmed to introduce a phase shift to the incident light at a time resolution of milliseconds. Integration of spatial phase modulators in optical benches as phase screens will allow for much more flexible experiments permitting a perfect correlation between the numerical simulations and the physical experiments.

[1] Grupo de Astrofísica, Universidade Federal de Santa Catarina, Campus João David Ferreira Lima, Caixa Postal 476 CEP 88040900, Florianópolis, Santa Catarina, Brasil (rrbernardi@astro.ufsc.br).

EXTINCTION COEFFICIENTS WITH AN ALLSKY CAMERA

G. S. Bortolotto[1], A. Kanaan[1], and D. Walker[2]

All sky cameras are a great alternative to the study of atmospheric conditions in an astronomical site. We show how to compute the instantaneous coefficients of atmospheric extinction for various moments in the same night. The images used were obtained by the camera SASCA (SOAR AllSky Camera) located at Cerro Pachon. To estimate the extinction coefficients we developed a method to measure the brightness of several stars at different air masses for the same instant. We developed a Python program that calculates azimuth and altitude for the stars and then converts them to pixel coordinates on the CCD. Comparing the positions calculated for a group of stars with their actual positions on the images, we can determine the distortion caused by the camera. After finding out the distortions we know exactly in which pixel a star falls on any date and time. At this point we created tables of star positions and did the photometry of them all on each image using the IRAF routine PHOT. These photometry tables are subsequently converted into multiple tables with apparent magnitude versus air mass for each star at a given instant. Our results show that the extinction coefficient calculated for different atmospheric moments is within two sigma of the values of the coefficients obtained through the monitoring of a single star at different air masses, demonstrating the feasibility of our approach.

[1] Departamento de Física, Universidade Federal de Santa catarina, Campus Universitário Reitor João David Ferreira Lima, CEP: 88040-900, Florianópolis, Santa Catarina, Brazil (germano@astro.ufsc.br).
[2] Cerro Tololo International Observatory, La Serena, Chile (dwalker@ctio.noao.edu).

THE HARD X-RAY TELESCOPES FOR MIRAX AND PROTOMIRAX

J. Braga[1], F. D'Amico[1], M. C. Ávila[1], B. H. Rodrigues[1,2], J. E. Grindlay[2], B. Allen[2], J. Hong[2], S. Barthelmy[3], and R. E. Rothschild[4]

The Monitor e Imageador de Raios X (MIRAX), under development at the National Institute for Space Research (INPE), Brazil, is a hard X-ray astronomy experiment that will be launched in low-Earth orbit (650 km altitude, 15° inclination) onboard the Lattes satellite mission in 2018. MIRAX

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

consists essentially in two coded-aperture imaging telescopes equipped with cadmium-zinc-telluride (CZT) solid-state room-temperature semiconductor detectors. One telescope (T1) has been in development at INPE′s Astrophysics Division and will fly in a high altitude (∼43 km) balloon in 2014 for testing and demonstration; this development is called the *protoMIRAX project*. T1 uses an array of 13×13 CZT planar detectors with dimensions 10mm×10mm×2mm and a 1 mm-thick lead coded mask with 20 mm openings in a 13×13 Modified Uniformly Redundant Array (MURA) basic pattern. It will have a 20° × 20° fully-coded field-of-view (FCFOV) and an angular resolution of 1.5°. T1 will be mounted in a balloon gondola with an attitude control and pointing systems as well as a 500 kbps telemetry and command capability for real-time operation and data acquisition. The imaging CZT detectors for the second telescope (T2) are being developed at the Harvard Smithsonian Center for Astrophysics (CfA). The detector plane for T2 will have a 0.6 mm spatial resolution and an area of 250 cm^2. A 0.3mm-thick tungsten mask with a random pattern will provide images with 6′ angular resolution with a 20° × 20° FWHM FOV. In this presentation we will describe the current status of MIRAX and present results of the protoMIRAX detector, telescope and balloon gondola developments.

[1] Astrophysics Department, National Institute for Space Research, Brazil.
[2] Harvard Smithsonian Center for Astrophysics.
[3] NASA Goddard Space Flight Center.
[4] Center for Astrophysics and Space Science, University of California San Diego.

GEMS/GSAOI: FROM COMMISSIONING TO OPERATIONS AND SCIENCE RESULTS

E. R. Carrasco[1], B. Neichel[1], F. Rigaut[2], C. Winge[1], F. Vidal[1], P. Pessev[1], A. Serio[1], G. Arriagada[1], W. Rambold[1], J. Luhrs[1], M. Boccas[2], C. Dorgeville[2], V. Fesquet[1], A. Lopez[1], C. Trujillo[3], R. Galvez[1], G. Gausachs[1], C. Araujo[1], T. Vucina[1], V. Montes[1], C. Urrutia[1], C. Moreno[1], C. Marchant[1], F. Collao[1], S. Diggs[1], F. Collao[1], G. Trancho[4], and M. Bec[4]

The Gemini Multi-conjugate Adaptive Optics System (GeMS) and the Gemini South Adaptive Optics Imager (GSAOI) are unique and complex facility Gemini instruments. GeMS/GSAOI provide a uniform, diffraction limited image quality at near-infrared (NIR) wavelengths over a field of view of 85" x 85" on the sky. The GeMS/GSAOI commissioning started at the beginning of 2011. After ∼2 years of dedicated work and more than 90 nights of on-sky commissioning, at the end of 2012 GeMS/GSAOI started to produce the first science results. In this presentation we describe in details the system performance, on-sky efficiency and present the scientific results produced by GeMS/GSAOI during the system verification process.

[1] Gemini Observatory/AURA, Southern Operations Center.
[2] Research School of Astronomy and Astrophysics, The Australian National University.
[3] Gemini Observatory/AURA, Northern Operations Center.
[4] Giant Magellan Telescope Organization.

MMTRON

T. de Graauw[1]

Millimetron is a 10-meter cooled space observatory that is optimized for the far-infrared and submm wavelength range. The facility has two operating modes: one can operate as a single-dish observatory or as an element of a space-earth VLBI system. It will have scientific capabilities that can address various key problems in astronomy and astrophysics such as the formation and evolution of stars and planetary systems, evolution of galaxies, quasars, etc. The telescope will be deployed in space and the panels of the primary mirror are to be adjustable to achieve an rms accuracy less than 10 micron. The telescope and instrument compartment will be cooled down to 4.5K by passive cooling and mechanical coolers. The instrument package is to include a set of heterodyne receivers operating in several bands between from 500 and 5000 GHz, a submm array camera/spectrometer and a mm array camera/spectrometer covering 50 micron to 3 mm. Millimetron is proposed as a Russian-led mission and is to include a wide international collaboration. Currently, the mission scheduled to be launched in 2020.

[1] ALMA.

SURFACE LAYER TURBULENCE PROFILING WITH THE SL-SLODAR AND LUSCI AT ESO PARANAL OBSERVATORY

G. Lombardi[1], M. Sarazin[2], F. Char[3], C. González Ávila[4], J. Navarrete[1], A. Tokovinin[5], R. W. Wilson[6], and T. Butterley[6]

In the context of the Surface Layer investigation at ESO Paranal Observatory, a Surface Layer Slope Detection And Ranging (SL-SLODAR) instrument prototype has been used at Paranal during 2012, while Lunar Scintillometer (LuSci) measurements campaigns are being carried out since 2008. Simultaneous Surface Layer profiling data from the two instruments are analysed in order to compare the two instruments to enforce their reliability and finely characterize the Paranal Surface Layer profile.

BETA is the slope of the turbulence power spectrum delivered by the SL-SLODAR. It is intended purely as a diagnostic tool to indicate whether the Cn2 profile can be trusted. When BETA is significantly less than 3.667 (Kolmogorov law value) this generally indicates that the wind speed is low and the data sets are too short to fully sample the low frequency components of the turbulence. Around the Kolmogorov value, the integrals form the SL-SLODAR and LuSci are pretty much the same. This is valid also in the first 20 m above ground only (SL).

Both instruments agree very well when the wind speed on the Paranal platform is higher than 3 m/s. This last result suggests that wind speed higher than 3 m/s allow to have more reliable turbulence profile measurements from both instruments for further analyses of the Surface Layer. Furthermore, the disagreement of the two instruments in connection with wind speed lower than 3 m/s also suggests that the wind speed is a critical parameter to be taken into account before the treatment of the data.

[1] European Southern Observatory, Casilla 19001, Santiago de Chile, Chile. (glombard@eso.org).
[2] European Southern Observatory, Karl-Schwarzschild-Strassee 2, Garching bei Muenchen, Germany.
[3] Universidad de Antofagasta, Unidad de Astronomia, Av.. U. de Antofagasta 02800 Antofagasta, Chile.
[4] Las Campanas Obs., Carnegie Institution of Washington, Colina El Pino Casilla 601, La Serena, Chile.
[5] AURA/CTIO/NOAO, Colina El Pino Casilla 603, La Serena, Chile.
[6] University of Durham, Department of Physics CfAI, South Road, Durham, UK.

SOUTH POL: REVEALING THE POLARIZED SOUTHERN SKY

A. M. Magalhães[1]

SOUTH POL will be a survey of the Southern sky in optical polarized light. It will use a newly designed polarimeter for an 80cm Robotic Telescope. Telescope and polarimeter will be installed at CTIO, Chile. The initial goal is to cover the sky south of declination -15° in about two years of observing time, aiming at a polarimetric accuracy $\leq 0.1\%$ down to V=15, with a camera covering a field of about 2.0 square degrees.

SOUTH POL will impact areas such as Cosmology, Extragalactic Astronomy, Interstellar Medium of the Galaxy and Magellanic Clouds, Star Formation, Stellar Envelopes, Stellar Explosions and Solar System, among others.

The polarimeter is currently being built and its optics and electronics assembled. We will describe the current status of the project.

This project is supported by FAPESP. AMM is also supported by CNPq.

[1] Departamento de Astronomia, IAG, Universidade de São Paulo.

IMPROVING INPE′S BALLOON GROUND FACILITIES FOR OPERATION OF THE PROTOMIRAX EXPERIMENT

F. Mattiello-Francisco[1], E. Rinke[1], J. O. Fernandes[1], L. Cardoso[1], P. Cardoso[1], and J. Braga[1]

The system requirements for reusing the scientific balloon ground facilities available at INPE were a challenge to the ground system engineers involved in the protoMIRAX X-ray astronomy experiment. A significant effort on software updating was required for the balloon ground station. Considering that protoMIRAX is a pathfinder for the MIRAX satellite mission, a ground infrastructure compatible with INPE′s satellite operation approach would be useful and highly recommended to control and monitor the experiment during the balloon flights. This approach will make use of the SATellite Control System (SATCS), a software-based architecture developed at INPE for satellite commanding and monitoring. SATCS complies with particular operational requirements of different satellites by using several customized object-oriented software elements and frameworks. We present the ground solution designed for protoMIRAX operation, the Control and Reception System (CRS). A new server computer, properly configured with Ethernet, has extended the

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

existing ground station facilities with switch, converters and new software (OPS/SERVER) in order to support the available uplink and downlink channels being mapped to TCP/IP gateways required by SATCS. Currently, the CRS development is customizing the SATCS for the kernel functions of protoMIRAX command and telemetry processing. Design-patterns, component-based libraries and metadata are widely used in the SATCS in order to extend the frameworks to address the Packet Utilization Standard (PUS) for ground-balloon communication, in compliance with the services provided by the data handling computer onboard the protoMIRAX balloon.

[1] Instituto Nacional de Pesquisas Espaciais, CP 515, S. J. Campos, SP, CEP 12201-970, Brazil (fatima.mattiello@inpe.br).

NEW ALGORITHM FOR CENTROIDING IN ELONGATED SPOTS FOR SHACK-HARTMANN WAVEFRONT SENSORS USING ARTIFICIAL NEURAL NETWORKS

A. T. Mello[1], A. Kanaan[1], and D. Guzmán[2]

To recover the resolution lost in a ground-based telescopes due to the atmospheric turbulence, it is necessary to use a technique known as Adaptive Optics (AO). The next generation of telescopes will have primary mirrors of more than 30 meter in diameter and will require AO systems from the ground up (Nelson et al. 2006). There are a number of challenges to implement an AO system at these scales. One of these challenges is the accurate measurement of the aberrated wavefronts using a laser guide star and a Shack-Hartmann wavefront sensor. Due to the diameter of the telescope and the use of the sodium layer in the upper atmosphere as photon return for the laser guide stars, the image of the guide star will appear elongated in the wavefront sensor. Typical centroiding algorithms such as Center of Gravity do not perform well under these conditions (Thomas et al. 2008). We present a new technique based on artificial neural networks for measuring the spot position with better accuracy than existing methods. Simulation results confirms that the new algorithm incurs in smaller errors with respect to other centroiding techniques in use.

[1] Dept. of Physics, Universidade Federal de Santa Catarina, Campus Universitário Reitor João David Ferreira Lima, Florianópolis, Brazil.
[2] Dept. of Electrical Engineering, Pontificia Universidad Catolica de Chile, Vicuña Mackenna 4860, Santiago, Chile.

COMPUTING DIFFERENTIAL REFRACTION AT ALL HELIOLATITUDES AND ZENITHAL DISTANCES: A HISTORICAL PERSPECTIVE

C. Sigismondi[1,2] and S.s Boscardin[2]

Ptolemy (about 150 AC) modeled atmospheric refraction influencing Al Farghani (831), Alhazen (1020), Sacrobosco (1256) and Witelo (1278): the Sun was supposed bigger at horizon like a coin appears under water in a curved bottle. The correct work of Ibn Sahl (984) remained forgotten.

Tycho measured the refraction on the 1572 supernova at various altitudes. Harriot, Kepler, Snell and Descartes found independently the refraction law after 1600. A modern formulation of vertical (0.5" zenithal to 35' at horizon) and horizontal (0.5" at all altitudes) differential refraction of solar diameter appears in Du Séjour (1786). Laplace's formula (1805) computes the vertical deformation of the solar disk, while the horizontal reduction of 0.5" is proportional to the chord's length. Dicke (1967) measured the solar oblateness to determine dynamical constraints to alternative theories of General Relativity. The Astrolabe of Rio de Janeiro measured in 1998-2009 the solar diameter at all heliolatitudes, by timing solar transits across fixed altitude circles: an equatorial excess larger than RHESSI (2008) and SDS (1992-2011) data remains after refraction's corrections. Meridian transits series measured at Rome Campidoglio (1877-1937) and Greenwich (1850-1940) behave as Rio data: the scatters between annual averages were larger than statistical dispersions of each value (Gething, 1955). Anomalous refractions measured with Rio Heliometer (2013) are low frequency seeing (0.01 Hz) acting to scales of the solar diameter (32'): they affect transits measurements with random perturbations hundreds times larger than the expected values calculated from the timing accuracy. These perturbations enlarge the differences between averages values binned either in time or heliolatitude: they are larger than statistical dispersions, suggesting a wider binning. The "adiabatic" approach of Rio Heliometer with high frequency measurements "freezes" the slow seeing image motion component.

[1] International Center for Relativistic Astrophysics, Rome.
[2] Observatório Nacional, Rio de Janeiro. (sigismondi@icra.it).

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

THE SOFIA AIRBORNE INFRARED OBSERVATORY - FIRST SCIENCE HIGHLIGHTS AND FUTURE SCIENCE POTENTIAL

H. Zinnecker[1]

SOFIA, short for Stratospheric Observatory for Infrared Astronomy, is a Boeing 747SP aircraft with a 2.7m telescope flying as high as 45000 ft in the stratosphere above 99 percent of the precipitable water vapor. SOFIA normally operates from its base in Palmdale, California, and a typical observing flight lasts for 10 hours before returning to base.

SOFIA has started astronomical observations in Dec 2010 and has completed some 30 early science flights in 2011, delivering a number of exciting results and discoveries, both in mid-infrared imaging (5-40mu) and in far-infrared (THz) heterodyne high-resolution spectroscopy which were published in mid-2012 in special issues of ApJ Letters and A & A, respectively. Meanwhile, in July 2013, as part of Cycle 1, SOFIA has deployed to New Zealand for a total of 9 flights (all of them successful) and has observed key targets in the southern hemisphere at THz frequencies, including star forming regions in the Large and Small Magellanic Clouds.

In this talk, I will present a few highlights of SOFIA early science and its future potential, when the full suite of 7 instruments will be implemented by the time of full operations in 2015. As Herschel ran out of cryogens in April 2013, SOFIA will be the premier FIR-astronomical facility for many years to come. Synergies with ALMA and CCAT must be explored.

SOFIA is a major bilateral project between NASA and the German Space Agency (DLR), however as an international observatory it offers observing time to the whole astronomical community world-wide, not only to the US and German primary partners.

[1] SOFIA Science Center at NASA-Ames, USA and DSI at Univ. of Stuttgart, Germany.

TEACHING & OUTREACH

DATA ACQUISITION SYSTEM FOR INSTRUCTIONAL SPECTROSCOPES

C. B. S. B. Almeida[1] and A. Hetem[1]

This article aims to present the software for data acquisition developed in scientific initiation program - IC, for use in the design of a spectrometer built by students. The program was built in C++, a language in wide use today. The origin of spectra used is a simplified model of rustic spectroscope. This equipment basically consists of a box that does not allow light to enter, except through a slit made in the side of it, a diffraction media and a camera for data acquisition. After the image acquisition, one executes the data processing, followed by the usual steps of reduction and analysis of this type of tool. We have implemented a method for calibrating the spectroscope, through which one can compare the incidence of the photons with characteristic of each monochromatic wave. The final result is a one-dimensional spectrum that can be subsequently analyzed.

[1] Universidade Federal do ABC, CECS, Brazil (cbsalmeida @aluno.ufabc.edu.br).

THE LATIN AMERICAN JOURNAL OF ASTRONOMY EDUCATION (RELEA): CONTRIBUTIONS AND PERSPECTIVES

P. S. Bretones[1], L. C. Jafelice[2], and J. E. Horvath[3]

The goal of this work is to present an analysis of articles published by the Latin American Journal of Astronomy Education (RELEA) since its beginning (2004) to the present. We analyzed the 59 articles available on the website of the journal (http://www.relea.ufscar.br), published in 15 issues. The articles were classified by: year of publication, issue, author's institutions, grade level, focus of the study and content. The results show that the number of articles is still small - although the journal has been initially qualified as B3 within the Journal Ranking scheme Qualis CAPES and in the latest ranking (current) advanced to the concept B1 in the Qualis, it is too early to expect an increase in the number of articles submitted. Among the main factors for the relatively low number of articles we can mention that the initially nominated Editorial Board did not succeed in a proper dissemination of the journal and call for papers, the ongoing absence of a "critical mass" of astronomy education researchers and the lack of publishing tradition in the area. Important aspects of the writing of articles submitted are also discussed, such as refereeing, acceptance rate of articles, participation of authors from countries other than Brazil and theoretical and methodological frameworks, as well as the recent editorial restructuration of the international Editorial

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

Board of the RELEA and the nomination of Associate Editors from Brazil. Concluding, it is possible to note the contribution to the field up to the moment through citations in other works in the field. However, it is necessary to advance with regard to: publishing more articles, articles from greater variety of Latin American countries, training of the community for a minimum quality of the writing of articles submitted for publication in a journal aimed at education research. In this sense, additional analyses of the published papers would be desirable. Finally, it is pointed out the need for greater dissemination of the journal to increase the number of submissions, encouraging the diversification of contents and methods and increase the participation of authors in general and from Latin America in particular, aiming to greater academic contribution for astronomy education at various levels and places.

[1] DME, UFSCar.
[2] Depto. de Física, UFRN.
[3] IAG, USP.

COMMUNITY SCIENCE WITH THE VVV

J. Cabral[1], S. Gurovich[2], J. Good[3], R. Medel[1], D. Garcia Lambas[2], E. Amôres[4], J. Clariá[5], and D. Minniti[6]

We are developing a web framework for community-science projects with the Vista Variables in the Via Láctea Survey with applications that includes: Identification and Classification of candidate galaxies and transients within them; Classification of light curves; Monitoring of the galactic centre; Monitoring of some solar system objects. The first phase of this project involves the eyeball detection/ classification of galaxies and the monitoring of supernovae and is being developed in python as part of Juan Bautista Cabral's PhD thesis.

[1] Universidad Tecnológica Nacional-Facultad Regional Córdoba, Argentina.
[2] IATE - OAC - CONICET, Argentina.
[3] Infrared Processing and Analysis Center, California Institute of Technology, Pasadena, CA, USA.
[4] UEFS, Departamento de Física, Feira de Santana, Brazil.
[5] OAC - CONICET, Argentina.
[6] Departamento Astronomía y Astrofísica, Pontificia Universidad Católica de Chile, Santiago, Chile.

ALFABETIZACIÓN EN ASTRONOMíA DE DOCENTES DE EDUCACIÓN PRIMARIA Y DE EDUCACIÓN SECUNDARIA EN LA PLATA

M. S. De Biasi[1] and R. B. Orellana[1]

La educación de este siglo tiene como uno de sus retos alcanzar la alfabetización cientfica de todos los ciudadanos para que comprendan y tomen decisiones sobre el mundo natural y sus cambios originados por la actividad humana utilizando el conocimiento científico. En esta misión los docentes de los niveles obligatorios de enseñanza juegan un papel clave por su rol de agentes multiplicadores del conocimiento. Se requiere, entonces de una adecuada alfabetización en ciencias de los docentes o, como mínimo, que dominen los temas científicos a enseñar.

En el campo de la Astronomía, numerosas investigaciones han señalado que maestros de primaria y estudiantes de profesorados poseen una escasa formación en estos temas (Camino 1995 y 1999, Gangui 2010), que frecuentemente presentan a los alumnos concepciones alternativas o no científicas de los fenómenos astronómicos cotidianos (Kriner 2004, Vega Navarro 2007, Gangui et al 2010); a lo que se suma la presentación confusa o errónea de algunos temas astronómicos en los textos escolares (Kriner 2004).

Desde 2011, la Facultad de Ciencias Astronómicas y Geofísicas, UNLP, ofrece un curso de capacitación destinado a fortalecer y actualizar los contenidos académicos y didácticos de los docentes del distrito La Plata utilizando diversas estrategias didácticas. Los contenidos comprenden los temas astronómicos de los diseños curriculares vigentes.

La evaluación diagnóstica de los conocimientos previos de los docentes cursantes sobre los contenidos de mayor presencia en los diseños curriculares mostró resultados similares a las investigaciones arriba mencionadas. Referente a los movimientos de la Tierra, en promedio, el 54% poseía conceptos erróneos y el 16% no los sabía; con referencia a la Luna el 56% poseía conceptos erróneos y un 4% no los sabía. Los resultados del curso mostraron que el 95% de los docentes revirtió sus conceptos previos erróneos, que adquirió criterios para la búsqueda de fuentes de información confiables y que el grado de conocimientos disciplinares y didácticos alcanzados por los docentes garantiza el efecto multiplicador de esta propuesta.

Esta capacitación fue acreditada con puntaje por el organismo educativo provincial en 2011, 2012 y 2013.

[1] Facultad de Ciencias Astronómicas y Geofísicas, UNLP, Paseo del Bosque s/n, 1900, La Plata, Argentina e Instituto de

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mafeus, J. Gregorio-Hetem & R. Cid Fernandes

Astrofísica de La Plata (CCT La Plata - CONICET, UNLP).

LEARNING EVALUATION OF MOON'S SYNCHRONOUS ROTATION MEDIATED BY COMPUTATIONAL RESOURCE

A. L. Fagundes[1], T. da Silva[1], and M. F. Barroso[2]

We report in this poster a learning evaluation about Moon's synchronous rotation by analyzing results of the use of hypermedia The Sun, Earth and Moon in blended learning intervention of an introductory physics discipline. The animation is displayed in a dynamic interactive screen on which the user has control of the progress of the animation sequence. The results are obtained from quantitative and qualitative analysis of issues drawn from a pre-test and a learning assessment counting with 77 students respondents. Learning outcomes indicate that animation helps in learning the phenomenon of Moon's synchronous rotation and students evaluate the use of animations as a motivator and facilitator of learning.

[1] PPGECT, Universidade Federal de Santa Catarina, Campus Trindade, Apartado Postal, 5153, 88040-900, Florianópolis, Santa Catarina, Brazil (adrianoitajuba@gmail.com.br).
[2] IF, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

"PLANETÁRIO E TEATRO DIGITAL JOHANNES KEPLER" AND ITS INSTITUTIONAL PEDAGOGICAL PROJECT

R. Z. Faria[1], M. R. Calil[1], E. R. Perez[1], M. Kanashiro[1], L. C. P. Silva[1], and F. Calipo[1]

This work relates the reception of schools, started on August 2012, in the astronomic laboratory of the "Planetário e Teatro Digital Johannes Kepler", located in the "Sabina - Escola Parque do Conhecimento" in Santo André, São Paulo. The idealization of this project, authorship of Marcos Calil, PhD, consists in four apprenticeship environments disposed around the planetary dome. They make reference to the System Sun - Earth - Moon (Tellurium), Solar System, Astronautic and Stars. On Tuesdays and Wednesdays the astronomic laboratory is used by Santo André municipal schools for focused lessons, being possible on Thursdays scheduling for private and public schools. On weekends and holidays is opened for the visitors. Since the inauguration to the beginning of activities with students, the monitor team was guided and trained on contents of Astronomy and Aeronautic to execute the schools service. This is done in four stages, which are: reception, course trough the astronomic laboratory, dome session and activities closure. During the reception the acquaintance rules are passed on for a better visit. Before starting the course the monitors do a survey about the previous knowledge of the students. On the astronomic laboratory resources of the environment are used to explain the contents of Astronomy and Astronautic, always considering the age group and the curriculum developed in classroom. After the course the students watch a planetary session supporting the contents seen on the astronomic laboratory. At the end a feedback is done with the students about the subject discussed. During the visit the teachers fulfill an evaluation about the place and the service. From August 2012 to November 2012 were attended between municipal, public and private schools. From the 4932 students attended, 92% belonged to the municipal network, 5% to the private network and 3% to the public network. From the 189 evaluations done by the teachers, 97.8% were satisfied, 2.1% partially satisfied e 0.1% unsatisfied with the reception promoted by the team of the planetary. Meantime the satisfaction presented on the evaluation is thought that the use of non-formal places is an ally of apprenticeship. The "Planetário e Teatro Digital Johannes Kepler" by its team collaborates for an education and divulgation of the Astronomy and Astronautic make part of the reality and quotidian of the students of the city of Santo André.

[1] Theatre Digital and Planetarium Johannes Kepler.

BRAZILIAN ERATOSTHENES PROJECT

R. Langhi[1,2] and J. Vilaça[3,4]

The objective of Brazilian Eratosthenes Project is the development and application of teaching training actions according the "docent autonomy" concept to basic Astronomy Education. Argentina coordinates the project in South America, but Brazil works in this project since 2010 with the theme "Projeto Eratóstenes Brasil" in the homepage: http://sites.google.com/site/projetoerato. Two schools measure a sticks shadow and communicate their results. After, they calculate an average radius

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mafeus, J. Gregorio-Hetem & R. Cid Fernandes

of Earth. The stick (gnomon) should stay in vertical position in the leveled ground. Since 2010, the project received hundreds of Brazilian schools with different experiments that were constructed with autonomy, because our site doesn't show some itinerary pre-ready to elaborate the experiments. To collect data for our research, we will use interviews via Skype with the teachers. These data are useful to researches about Science Education area and the Teaching Formation. Teaching professional practice could change and we see modifications in the teachers work, what depends of their realities and context. This project intents to respect the docent autonomy. This autonomy to responsible modifications during continued formation is called "activist formative model" according Langhi & Nardi (Educação em Astronomia: repensando a formação de professores. São Paulo: Escrituras Editora, 2012). This project discusses about researches in Astronomy Education - still extreme rare in Brazil, when we compare with other areas in Science Education. We believe that actions like this could motivate the students to learn more Astronomy. Furthermore, this national action can be a rich source of data to investigations about teaching formation and scientific divulgation.

[1] Polo Astronômico Casimiro Montenegro Filho, Fundação PTI/BR, Foz do Iguaçu, Brazil (rlanghi@fc.unesp.br).
[2] Fomentation: PTIC&T/FPTI-BR and PROEX-UNESP.
[3] Polo Astronômico Casimiro Montenegro Filho, Fundação PTI/BR, Foz do Iguaçu, Brazil (janer@pti.org.br).
[4] Fomentation: PTIC&T/FPTI-BR.

INTERACTIVE MATERIALS IN THE TEACHING OF ASTRONOMY

J. A. Macêdo[1,2] and M. R. Voelzke[2]

This study presents results of a survey conducted at the Federal Institution of Education, Science and Technology in the North of Minas Gerais (IFNMG), and aimed to investigate the potentialities of the use of interactive materials in the teaching of astronomy. An advanced training course with involved learning activities about basic concepts of astronomy was offered to thirty-two Licenciate students in Physics, Mathematics and Biological Science. The following steps were to be taken: i) analysis of the pedagogical projects (PPC) of the licenciates at the IFNMG, research locus of its Campus Januária; ii) analysis of students' preconceptions about astronomy and digital technologies, identified by the application of an initial questionnaire; iii) preparation of the course taking into account the students' previous knowledge; iv) application of the education proposal developed under part-time presence modality, using various interactive tools; v) application and analysis of the final questionnaire. The test was conducted with the qualitative and quantitative methodology, combined with a content analysis. The results indicated that in the IFNMG only the licenciate-course in physics includes astronomy content diluted in various subjects of the curriculum; the rates of students prior knowledge in relation to astronomy was low; an evidence of meaningful learning of the concepts related to astronomy, and of viability of resource use involving digital technologies in the Teaching of astronomy, which may contribute to the broadening of methodological options of future teachers and meet their training needs.

[1] IFNMG, Campus Januária. São Geraldo Farm, S/Nº, Januária Road, km 6, 39480-000, Januária, MG, Brazil. (josue.macedo@ifnmg.edu.br).
[2] Cruzeiro do Sul University, Campus Liberdade, Galvão Bueno Street 868, 01506-000, São Paulo, SP, Brazil. (mrvoelzke@hotmail.com).

ELEMENTARY SCHOOL TEACHERS' CONCEPTIONS ABOUT THE APPARENT MOVEMENT OF THE SUN AND THE SHADOWS OF THE OBJECTS

D. I. Machado[1,2]

A research about the astronomical conceptions of 65 elementary school teachers, developed at the last module of a continuing education course, in 2012, is described. The module addressed the apparent movement of the Sun in the sky and its relation with the shadows if the objects. Two types of sundials were built and tested. A concrete model was used to simulate the phenomena. A test with five open questions was applied to the participants before and after the activities. Initially, the participants already had notions about the themes treated, because almost all recognized: the existence of variations in the position of the Sun in the sky both throughout the day as well as during the year; the existence of relations between such apparent movements and changes in the shadows of the objects; the possibility of using the shadows of the objects to measure time. However, 53.8% of the participants expressed, at first, the misconception that the Sun passes daily by zenith. And, in general, the responses had incomplete explanations. After the activities, some development

in the explanations of the phenomena was observed. For example, there was an increase in the percentage of responses: indicating that the length of the shadows varies throughout the day (from 18.4% to 41.6%) and during the year (from 6.1% to 29.2%), depending on the position of the Sun; considering sundials as devices that permits the reading of the hours on the basis of the behavior of the shadows (from 3.1% to 29.3%); with the opinion that the sun is not daily by zenith (from 36.9% to 95.4%).

[1] Western Paraná State University, Foz do Iguaçu, Brazil (dpedm@uol.com.br).
[2] *Support:* Casimiro Montenegro Filho Astronomy Center (FPTI/BR).

OEI, GTTP AND ADVENTURERS OF THE UNIVERSE: TRAINING TEACHERS AND DISSEMINATING SCIENCE IN THE SOUTH OF BRAZIL

D. B. Pavani[1], M. F. O. Saraiva[1], and H. Dottori[1]

Itinerant Educative Observatory (OEI) is a permanent program of our Department of Astronomy since 1999. It aims to lecture Astronomy to teachers of fundamental and middle levels, using attractive resources such as telescopic observations, audiovisuals, and multimedia. The training courses are requested by different cities of Rio Grande do Sul and nearby states and are organized by a local committee of the requesting city. In 2014, with federal funds, we are uniting efforts with other extension project: the Galileo Teacher Training Program (GTTP). This is an international program developed to train teachers in the effective use of astronomy education tools and resources in their science classes. The program, that is a legacy of IYA2009, aims to create a worldwide network of Galileo Ambassadors the promoters of the training workshops and Galileo Teachers the teachers who bring the learned methodologies into classroom. To supplement these activities, we initiated a new program in 2012 called Adventurers of the Universe. University professors, undergraduates students and teachers of high-school and elementary school of social vulnerable communities develop transdiciplinary didactic sequences where Astronomy is the central focus to motivate different processes of teaching and learning, considering different learning levels, designed for direct use in the classroom. The objective of the program is to contribute to the didactic transposition through the discussion about how to relate astronomy with other science and non-science disciplines. In 2012 we collaborated with 20 teachers of one school, and 900 students. In 2013, the collaborations were expanded to include teachers and students of 3 other schools.

1Department of Astronomy, Physics Institute, UFRGS, Brazil.

RECA: A NETWORK BY STUDENTS, FOR STUDENTS

M. C. Remolina Gutierrez[1], S. Velasco Moreno[1], P. Hoyos Restrepo[1], J. D. Jimenez Nieto[2], A. F. Ramos[3], and J. C. Buitrago Casas[3]

RECA (Red de Estudiantes Colombianos de Astronomía) is a national network created by Colombian students that needed to be connected by their love for astronomy and astrophysics. It compiles most of the university groups and individuals that are willing to make part of a bigger community that gives benefits such as outreach activities, student links, and resources. This work is divided in 3 main parts. The first one is a quick review of the history of RECA since it was proposed in the III Colombian Astronomy Congress until today. After that, we review all the achievements and activities that the network has made and the people that collaborated to make it possible. Finally, we emphasize the vision that RECA has for the next years and what it can give to the development of astronomy in Latin America regarding to students flux, training and research.

[1] Universidad de los Andes, Colombia.
[2] Universidad Distrital Francisco Jose de Caldas, Colombia.
[3] Universidad Nacional de Colombia.

BRAZILIAN PARTICIPATIONS IN THE INTERNATIONAL ASTRONOMICAL SEARCH COLLABORATION

G. A. Rojas[1], L. J. Dalla-Costa, A. T. Kalmus, E. C. Kroth, M. F. Matos, A. L. Silva, G. G. Silva

International Astronomical Search Collaboration (IASC) is an international educational project between universities, schools, observatories and research institutions. Its main objective is to enroll high school and college students in the monitoring and discovery of asteroids and Near Earth Objects (NEOs), especially Potentially Hazardous Asteroids. The methodology consists in the analysis of

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

astronomical images obtained in several observatories in North America and Hawaii. The images are distributed throughout the school network and the results must be delivered in a 72-hour timeframe. Since 2010 Brazilian universities and schools have joined IASC, resulting in over a dozen new asteroids found (3 of them NEOs), and hundreds of measurements for already known asteroids. A major event in this collaboration was the All-Brazil Asteroid Search Campaign, which was conducted in September 2012. 2013 marks the fourth year of Brazilian participations in IASC, with one important milestone: the third straight appearance of a Brazilian institution in the Pan-STARRS campaign, which uses the PS1 telescope in Haleakala, Hawaii. We will present a summary of the overall results, as well as the latest news from 2013 campaigns. We will discuss the impact promoted by the past events, such as how the interest in astronomy changed before and after the campaigns, and it has helped the students to choose their future careers.

[1] Universidade Federal de São Carlos, Brazil.

SOUTH AFRICA CALLS ITALY: EFFECTIVE EXCHANGE ACTIVITY THROUGH COSTLESS (SKYPE LIKE) CONNECTIONS IN THE FRAMEWORK OF THE EU UNAWE PROJECT

A. Zanazzi[1], L. Albanese[1], and Troshini Naidoo[2]

In summer 2012 the Italian EU-UNAWE team joined with the South African team in Cape Town, working with the township schools organizing activities at school and also a teachers' training event at the SAAO Observatory. In order to involve in the exchange not only the project's experts but also to the teachers and the children, we organized Skype connections between the Cape town teachers participating in the project and the teachers in Sicily (South Italy) that also participated in one of the Italian training sessions and later between the children of the Italian school and those in Zanemfundo School (Cape Town). Thanks to this chance of seeing each other and talking directly, children have - with huge interest and participation - shared and learned methods, experiences, curiosities. They shared their prepared actual science researches, in order to understand why an equal gnomon cast different shadows at the same time in the two countries. The teachers confronted on curricula, didactic methodologies such as working with a background story during the whole school year, interdisciplinary uses of astronomy, languages etc. The EU-UNAWE project and International or Regional conferences such as LARIM are perfect chances to create exchanges between countries all around the World, and this simple communication model between children and teachers appears like an enormous resource yet to be fully exploited.

[1] INAF - Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5 - 50125 Firenze, Italy.
[2] South African Astronomical Observatory, Observatory 7935, Cape Town, South Africa.

LIST OF ABSTRACTS

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes

XIV Latin American Regional IAU Meeting (Florianópolis/SC, Brazil, 25-30 November 2013)
Editors: A. Mateus, J. Gregorio-Hetem & R. Cid Fernandes