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ABSTRACTS OF CONTRIBUTED PAPERS

OBSERVATIONS OF COMETARY NUCLEI, FROM CASLEO

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CCD photometric observations of more than ten Jupiter Family comets were performed using the 2.15-m telescope at CASLEO, Argentina in March 1995, March 1997 and May 1999. The data were reduced with IRAF in standard ways. We will do absolute photometry using DIGIPHOT/APPHOT package included in IRAF. Standars stars from Landolt (1992) and Stobie et al. (1985) will be used for calibration purposes. Estimates for the effective radius of the nuclei will be computed considering a typical geometric albedo, pv = 0.04. Wherever possible, cometary image profiles will be compared with stellar profiles, in order to determine the existence of a faint coma. Many of the observed comets were active at heliocentric distances larger than 4 AU. This is part of a long-term observational program designed to obtain nuclear magnitudes estimates of a large sample of Jupiter family comets (Licandro et al., Icarus 147, 161, 2000).

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PRE-ENCOUNTER MODELS OF COMET 19P/BORRELLY FOR THE DEEP SPACE 1 MISSION

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The Deep Space 1 Mission (DS1) is scheduled to encounter comet 19P/Borrelly on 22 September 2001. Knowledge of basic properties of the cometary environment is desired to enhance the scientific return of the mission. A coma model for 19P/Borrelly is presented that consistently represents the cometary environment from the nucleus surface to the solar wind interaction region (Benkhoff & Boice, P&SS 44, 665, 1996; Wegmann et al., P&SS 46, 603, 1998). Neutral gas and plasma dynamics and spatial distributions of various cometary species are presented for scientific planning and risk assessment for the DS1 encounter. Predictions of x-ray emissions are made for coordinating in situ plasma measurements with Chandra observations as well as other predictions for planning experiments during the encounter.

Our major findings can be summarized as follows: (1) Estimates of the dust environment show that the risk is very small for a mission-ending dust hazard at the current flyby distance of about 1500 km. (2) Using estimates of the solar wind conditions and the gas production rate at the time of encounter, a bow shock is expected at a distance of about 60,000 to 80,000 km along DS1s trajectory, however, DS1 will not penetrate the contact surface. (3) At closest approach, the plasma speed steadily decreases to about 2 km s^{-1}, with an ion temperature of about $2x10^5$ K and electron temperature of about $2x10^4$ K (dominated by photoelectrons), and an ion number density of about 100 cm^{-3}. (4) A kidney-bean shaped x-ray emission region of approximately 80,000 km by 60,000 km in extent is predicted as seen from earth (40 degree aspect angle) with a maximum intensity of about $8x10^{-5}$ erg cm^{-2} s^{-1}, assuming their origin is charge exchange of heavy, highly ionized solar wind ions with cometary neutrals, primarily water group species (Cravens, Geophys. Res. Lett. 24, 105, 1997). We wish to acknowledge funding from NASA for the DS1 Science Team, with additional support from NAO (Japan) and FAPESP (Brasil).

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COULD DYNAMIC PRESSURE EFFECTS CAUSE THE DISCONNECTION EVENTS IN COMET P/HALLEY?

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Cometary and solar wind data are compared with the purpose of identifying the solar wind conditions which are associated with comet plasma tail disconnection events (DEs). The cometary data are from *The International Halley Watch Atlas of Large-Scale Phenomena* (Brandt et al. 1992). A systematic visual analysis of the atlas images (Voelzke & Matsuura, P&SS 46, 835, 1998) revealed, among other morphological structures, 47 DEs along the plasma tail of comet P/Halley. The solar wind data are *in situ* measurements from IMP-8 (King, IMS Source Book p10, 1982), which are used to construct the actual variation of solar wind speed, density and dynamic pressure during the analysed intervals. This work compares the onsets of these DEs with the solar wind dynamic pressure variations in order to clarify if pressure effects play an important role in the formation of DEs and if they can even be considered as the triggering mechanism. The analysis however reveals a poor correlation (23%) between the onsets of P/Halley's DEs and the associated pressure effects. This result is in good agreement with Wegmann (A&A 294, 601, 1995) who concluded in an independent and theoretical analysis, that about 25% of all tail disconnections must be caused by interplanetary shocks. The DEs onsets of comet P/Halley analysed in this work, calculated from observational data, do not corroborate the idea that DEs are associated with dynamic pressure effects.

S3OS2: A VISIBLE SPECTROSCOPIC SURVEY OF AROUND 800 ASTEROIDS

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Most of the asteroids have their orbits between 2.2 and 3.3 A.U. from the Sun, in a region where the transition between terrestrial and giant planets takes place. Therefore, the identification of the compositional and mineralogical properties of a large sample of these objects will ultimately led to a better understanding of the physical and chemical evolution of the Solar System. We present a new visible spectroscopic survey of asteroids, the Small Solar System Objects Spectroscopic Survey (S3OS2). This survey has been carried on between Nov. 1996 and Sep. 2001 at the 1,52-m telescope at ESO (La Silla, Chile), aiming to contribute to a better understanding of the compositional distribution in the main belt. More than 800 asteroids have been observed and the first results have been presented in Lazzaro et al. (BAAS 29, 975, 1997). Several families and groups of asteroids have been studied, like the families of Flora (Florczak et al., Icarus 133, 233, 1998), Themis (Florczak et al., A&ASS 134, 463, 1998) and Eunomia (Lazzaro et al., Icarus 142, 445, 1999), and the groups of Hungaria and Phocaea (Carvano et al., Icarus 149, 173, 2001). Among the results obtained with our survey, the discovery of a basaltic asteroid in the outer main belt (Lazzaro et al., Sci 288, 2030, 2000) should be stressed. The only basaltic asteroids known in the belt were 4 Vesta and some small asteroids considered as fragments of it. The discovery of the basaltic crust of the asteroid 1459 Magnya indicates that a substantial thermal heating has occurred in the outer belt. As a general result, although our data confirm earlier results about a continuous trend of compositions in the asteroid belt, they also reveal a more prominent mixing than previously supposed. This mixing is more pronounced in small objects due to collisions and dynamical processes and also in "scattered" objects that have high-inclination and/or high eccentricity orbits.

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PHOTOMETRY OF ASTEROIDS MEMBERS OF MARIA AND THEMIS FAMILIES

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In observations carried out during the last 3 years on asteroids members of Themis and Maria families, we obtained light curves and rotational periods of members of that families. The observations were made with the 154-cm telescope of *Bosque Alegre Astrophysical Station*. The results shows that average rotational periods found in the Maria family are smaller than the average periods in the family of Themis. We found the rotational periods of: (727) Niponia, (1996) Adams, (2151) Hadwiger, (2429) Schurer, (2903) Zhubai and (4099) 1988AB5,

all from the family of Maria. From the family of Themis we found the rotational periods of (996) Hilaritas, (1171) Rusthawela and (1782) Schneller.

Name	Family	Period (hr)	Amplitude
(727) Niponia	Maria	4.20	1.19
(1996) Adams	Maria	3.30	0.4
(2151) Hadwiger	Maria	2.72	0.33
(2429) Schurer	Maria	7.03	0.33
(2903) Zhubai	Maria	6.15	0.48
(4099) 1988AB5	Maria	3.25	0.25
(996) Hilaritas	Themis	11.30	0.94
(1171) Rusthawela	Themis	5.28	0.49
(1782) Schneller	Themis	7.70	0.63

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COLLISIONS BETWEEN ASTEROIDS

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It is accepted that asteroid's families are the consequence of catastrophic impacts between asteroids. To try to understand some properties of the Main Belt families, computer simulations have been done wich bear on the hardness of the impacted body (Benz, Icarus 142, 5, 1999), the velocity field (Zappala, Icarus 124, 156, 1996) and size of the resulting fragments, as well as laboratory experiments which photograph the impact (Fujiwara, Icarus 44, 142, 1980). But none of these works take into account the initial spin rate of the impacted body nor the spin rate of the resulting fragments. In our model we consider N interacting ellipsoids described by an appropriate density function. Knowing the sizes and velocity distribution, we can simulate the different collisions wich originated the families. Resolving the Lagrangian of the system we can follow the trajectory and spin rate of each fragment and the possibility of some reaccumulation.

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GAUSS' FORMS OF THE LAGRANGE'S EQUATIONS FOR THE ANALYTICAL SOLUTION OF THE POSTNEWTONIAN TWO BODY PROBLEM

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The equations of motion of the n-body problem under the General Relativity formalism are the so-called EIH equations, now extensively used in the analytical and numerical theories necessary to construct the ephemeris of the bodies in the solar system. It's possible to obtain an analytical solution of the EIH equations with $n = 2$. In fact, various solutions are known (Soffel, Relativity in Astrometry, Celestial Mechanics and Geodesy, Springer Verlag, 1989). One of them, that proposed by Damour & Deruelle (Ann. Inst. H. Poincaré 43, 107, 1985), has deserved attention due its classical-like approach resolution. This solution gives six constants of motion known as "post-Newtonian orbital elements". As in the classical case, by including any external perturbation force the problem can be treated through the variation of the arbitrary constants method. Calura et al. (Phys. Rev. D 56, 4782, 1997) obtained the Post-Newtonian Lagrangian planetary equations (PNLPE) which express the time variation of the post-Newtonian orbital elements. Here, we present the Gauss's forms of the PNLPE, which have the advantage that the external perturbation is explicitly written in terms of three mutually orthogonal components of the perturbative acceleration. These equations can be viewed as a generalization of the Classical Gaussian forms of the well-known Lagrange's planetary equations and can be utilized to construct approximate solutions of some kind of models which require simultaneously the adoption of the effects from the "space-time curvature" and any other external perturbation force.

PROJECTIVE METHODS IN DYNAMICS AND OTHER FIELDS OF PHYSICS

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This paper deals with projective connections among the fields of physics. To achieve the appropriate results we take advantage of an unitary projective invariant of dynamics which can be deduced from the well known anharmonic relationship. We select for each field of physics auxiliary variable tri–rectangular coordinate systems referred, for each field, to a fixed reference system. The changing directional cosines are used as standard set of variables. Then we construct from these sets a respective set of unitary hyperspheres, which evidently belong to vectorial fields of different dimensions. The first step is the comparison of these "field spheres" (It is easily shown that this construction can be achieved, whether the field may be discrete or continuous as well). To compare the field unitary hyperspheres we must first reduce each one to the standard form of hyperspheres of arbitrary finite radius). In these conditions the theory of conformal hyperspheres can be applied. This can be afforded in view of: 1) The selection of appropriate initial conditions; 2) The fact that the terms in the expressions of the radius of the hyperspheres depend functionally on the original variable directional cosines (numbers) and 3) The existence of recurrent theorems. With these premises we can put equal to zero the value of each one of the radius of the corresponding field hyperspheres. Now we can project these several radius (represented by hyperquadric equations) by means of hyperplanes of the corresponding dimensions, obtaining in this way for each field a set of spheres in the tridimensional space. Projective relationships are then established between the different tridimensional spheres by drawing central connecting planes, by means of which the invariant unitary relationship leads to the desired linkage between the different fields. If relativity solutions are introduced, (we suppose that a spherical model of fourteen dimensions is used) we need only, instead of the einstenian original hypersphere solution, consider an infinite denumerable set of equivalent euclidean hyperspheres in which the expressions for the squares of the ds are put in terms of constants values of the g coefficients.

Remark: As special result we get from the introduction of canonical sets of variable coordinates and under the consideration of changing values of directional cosines of appropriate auxiliary sets of tri–rectangular axes, a stability criterion for planetary systems of solar kind (in which the theorem of total angular momentum is valid evidently).

EFECTO DE LAS RESONANCIAS SECULARES EN LA ZONA EXTERIOR A SATURNO

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La existencia de las Resonancias Seculares ha sido conocida ya en el siglo XIX. Le Verrier (1856), Tisserand (1882) y Charlier(1900,1902) notaron que el límite interno del cinturón de asteroides, cercano a 2 UA, es prácticamente coincidente con la resonancia secular debida a $g = g_6$, donde g identifica la frecuencia de la longitud del perihelio del asteroide y g_6 la de Saturno. En 1969, Williams presentó su teoría analítico-numérica con la cual identificó la ubicación de tres resonancias seculares importantes correspondientes a long. de perihelio de Júpiter y Saturno y long. de nodo de Saturno. La importancia de las Resonancias Seculares en la evolución dinámica de los cuerpos del Sistema Solar ha sido analizada por diversos autores y entre otros efectos se las considera potencialmente importantes para el transporte de meteoritos y de objetos Apolo/Amor/Aten a órbitas cruzadoras de planetas. En este trabajo presentamos los estudios realizados en la zona comprendida entre Urano y Neptuno, considerando las resonancias en longitud de perihelio de los planetas mayores, para lo cual nos hemos basado en el trabajo de Knezevic et al.(1991) donde se encuentran localizadas las resonancias seculares de los cuatro planetas mayores entre 2 y 50 UA. Para objetos con semiejes entre 23.5 y 24.5 UA y una inclinación inicial de entre 10^o y 16^o se tienen perturbaciones producidas por g_5, g_7 y g_8, o sea Júpiter, Urano y Neptuno. Se investigó la evolución orbital de asteroides ficticios mediante la integración numérica de las ecuaciones de movimiento utilizando el código de Bulirsch-Stoer. En un sistema formado por Sol-Júpiter-Saturno-Urano-Neptuno, se generaron partículas que cumplieran las siguientes condiciones de resonancia de perihelio con Júpiter, Urano o Neptuno, según el caso. $\omega - \omega_P = 0$.

El análisis de los datos producidos por la integración, muestra que todos los asteroides escapan de la zona convirtiéndose en cruzadores de Neptuno, donde el argumento o variable de resonancia ($\omega - \omega_P$) presenta un comportamiento distinto en cada resonancia considerada.

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RESONANCIAS DE MOVIMIENTOS MEDIOS DE TRES CUERPOS

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Se ha analizado y discutido la importancia que puede tener una resonancia de movimientos medios de tres cuerpos en la región comprendida entre Urano y Neptuno. En trabajos recientes (Nesvorny, D. y Morbidelli, A., 1998), se ha demostrado la importancia que este tipo de resonancias puede tener como origen de caos en órbitas del cinturón principal. En nuestro caso se trata de analizar el comportamiento de partículas ficticias, sin masa, combinando excentricidades e inclinaciones de manera de abarcar un cierto rango e integrar las ecuaciones de movimiento de los tres cuerpos: Urano-Asteroide-Neptuno, para partículas con movimientos medios que cumplan con una de las siguientes relaciones:

$\sigma_1 = -2\lambda_N + 3\lambda - \lambda_U$

y

$\sigma_2 = 3\lambda_N - 4\lambda + \lambda_U$.

Las integraciones se llevaron a cabo utilizando el código Bulirsh-Stoer. La cantidad de objetos generados no es suficientemente grande como para dar comportamientos estadísticos, pero de todos modos los resultados obtenidos muestran que todos los cuerpos considerados escapan de la zona y una gran parte de ellos lo hace hacia la zona interior del Sistema.

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HIGH RESOLUTION OBSERVATIONS OF RECONNECTED MAGNETIC LOOPS

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In this work we find observational evidence of magnetic reconnection in a flare that occurred on 15 October, 1999. We concentrate our study in the evolution of bright coronal loops appearing at flare onset. Active region (AR) NOAA 8731 was observed by SoHO and TRACE satellites and ground-bases observatories (Wroclaw Obs., Poland). MDI/SoHO longitudinal magnetograms give us the opportunity to model the magnetic field. We extrapolate the photospheric longitudinal magnetic field to the corona under the linear force-free assumption taking different values of α, which are determined to best fit the coronal loops observed with TRACE. Computing the magnetic topology of the AR, we find the presence of "quasi–separatrix layers" (QSLs) and "bald patches" (BPs). QSLs appeared related to a new emerging bipole and the main active region polarities. Interaction between loops belonging to these flux concentrations at QSLs originate the former flare kernels. Loops where energy is deposited after reconnection are seen bright in TRACE images at 12:43 UT. A second set of loops is observed to brighten a few minutes after. These loops are associated with BPs. We conclude that these observations represent a direct evidence of magnetic reconnection at QSLs during flares, and that this former energy release modifies the global magnetic configuration inducing a second release at BPs and their associated separatrices.

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PECULIAR ACTIVE REGIONS DURING THE LAST TWO SOLAR CYCLES

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We perform a statistical study of the spatial and temporal distribution of "peculiar" active regions (ARs) along solar cycles 21 and 22. ARs usually appear in the photosphere in the form of bipolar concentrations of magnetic flux, by "peculiar" we mean regions in which the main polarities present a high tilt angle with respect to the solar equator (as compared to the average one, the so called Joy's law) and rotate one around the other along several solar rotations. Our results show that these regions are spatially distributed as usual ARs when no selection on their magnetic flux is applied. When classified according to their flux, ARs above 10^{22} Mx follow closely the butterfly diagram; while those with lower flux have a wider latitudinal distribution. Temporaly speaking the "peculiar" ARs follow the activity cycle, but their distribution is, in general, very structured with a clear tendency to show dual-

peak maxima. This kind of temporal evolution is also found in the number of the most energetic solar flares. We suggest that the studied ARs might be an important source of activity due to their magnetic complexity and unusual behaviour.

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INFERRING THE WRITHE OF EMERGING FLUX TUBES FROM THE EVOLUTION OF THE ORIENTATION OF BIPOLE AXES

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We study the long term evolution of 22 bipolar active regions (ARs) in which the main polarities turn one around the other along several solar rotations. We interpret this peculiar evolution as the emergence of distorted magnetic flux tubes. To investigate the relevance of the kink instability as the origin of the deformation, we compare the sign of the twist and the writhe of the flux tubes. Helicity conservation during the development of the kink instability requires that the writhe and the twist have the same sign (necessary but not sufficient condition). We infere the handedness of the writhe from the evolution of the tilt angle of the AR bipole axes as observed in magnetic synoptic maps from Kitt Peak National Solar Observatory. We obtain the sign of the twist using vector magnetograms from Haleakala Stokes Polarimeter at Mees Solar Observatory. We find that no more than 32 % of the ARs can plausibly be associated to the kink instability, while 59 % cannot. Then, we suggest that the deformation of the flux tubes is dominantly caused by their interaction with plasma motions during their ascent through the convection zone (in the same way as proposed in López Fuentes et al. 2000, ApJ 544, 540).

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FIRST DETECTION OF THE IMPULSIVE AND EXTENDED PHASES OF A SOLAR RADIO BURST ABOVE 200 GHZ

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We present the first evidence of the extension of the gyrosynchrotron spectrum of an impulsive solar flare radio burst in the synchrotron domain above 200 GHz. These observations obtained with the new Solar Submillimeter wave Telescope (SST) were compared with microwave, soft X–ray and hard X-ray measurements. The emitting electrons radiated in an average magnetic field of 400–600 G, and showed a hard energy spectrum (power law index ≈ 2.7). The expected > 1 MeV gamma-ray continuum emission from these electrons is comparable to that detected for mid-size electron-dominated events and the hard X-ray flux they would produce at 100 keV is consistent with the observations.

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A SEMIEMPIRICAL MODEL FOR THE LARGE-SCALE MINIMUM ACTIVITY SOLAR CORONA

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We present a simple semiempirical MHD model for the large scale structure of the minimum activity solar corona. The model is axisymmetric and stationary, and accounts for the gas pressure gradient effects on the magnetic large scale structure.

Observational constrains for the model were taken during past solar cycle minimum (1996). For the coronal base magnetic field strength, Kitt Peak magnetograms (of July 1996) were analyzed. Observationally guided temperature models as a function of height were developed, at the equator and the pole, using ultraviolet coronograph data taken in 1996 with the UVCS instrument on SOHO spacecraft (Cranmer et al., ApJ 511, 481, 1999, and our own analysis). The model reproduces the observed streamer belt closed field lines region, predicting high plasma β values (> 1) in that region, and low β values in the coronal hole region, in concordance with other MHD models (e.g., Suess et al., Space Sci. Rev. 87, 323, 1999). The model also produces wind solutions, with plasma outflow velocities reaching –as observed– significantly larger values along open field lines arising from the coronal holes than along open field lines surrounding the streamer belt (Vásquez et al., AIP Conf. Proc. 471, 243, 1999, 2001). White light and EUV images synthesized from the model (Vásquez et al., Space Sci. Rev. 87, 335, 1999; ApJ 2001 in preparation) show good overall agreement with cycle minimum observations (Gibson et al., ESA SP-404, p407, 1997; JGR 104, 9691, 1999; Guhathakurta et al., JGR 104, 9801, 1999).

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DYNAMICS OF THE CORONAL MAGNETIC FIELDS INFERRED FROM MULTIFREQUENCY RADIO OBSERVATIONS OF A SOLAR FLARE

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We analysed multi-frequency radio and hard X rays observations of a M1.5 solar flare occurred in 1998 November 5. The event was observed at various discrete radio frequencies from decimetric to microwave wavelengths, covering a wide range of coronal altitudes. Using combined imaging radio and hard X ray emissions it was possible to follow the dynamics of the magnetic field from the low corona up to about 0.5 solar radius above the photosphere. The event was divided in four time intervals based on the turnover frequency of the radio spectra. The time profile shows four main 10 s structures associated to the last two defined intervals. The consecutive structures show an increasing turnover frequency, and the corresponding hard X ray spectra were well fitted by a double power law with a harder spectral index and increasing energy break. The imaging analysis at hard X rays and decimetric/metric waves associated to the different intervals, in association to the main structures, showed the presence of various and distinct emitting sources. The results suggest the event was produced by different injection of energetic electrons with increasing spectral hardness in a dynamic and complex magnetic topology. The energy release mechanism started to operate at high coronal altitudes, involving large scale magnetic loops, connecting the eruptive center to remote regions, and afterwards operating in small scale loops in the flaring region.

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POSSIBLE ASSOCIATION OF CMES TO THE ONSET OF SOLAR RAPID SPIKES OBSERVED AT SUBMM-WAVES

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We present a study on the association between the onset of rapid solar spikes (100-300 ms) observed at submillimetric waves (212 and 405 GHz) by the new Solar Submm-wave Telescope (SST) tracking solar active centers and large scale coronal activity. One large GOES X1.1 class solar flare occurred on March 22, 2000, producing two coronal mass ejections (CMEs) detected by LASCO experiment on SOHO. The main flare was reported at active region AR8910, but other neighbouring ARs have been reported active at about the same interval of time (17-20 UT). A dramatic enhancement of the submm-wave pulses rate was observed at about 1730 UT. The times of CMEs origin close to the solar surface have a surprisingly good association with the onset of the two major enhancement of the submm-wave spikes'occurrence rate. Similar results were obtained for another CME occurred on April 6, 2001 on AR 9415. The preliminary results give a strong suggestion that submm-wave pulses might have a close

physical connection with the CMEs'acceleration process near the solar surface.

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CCD PHOTOMETRY AND ANALYSIS OF THE ECLIPSING BINARY HV 2241

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We present a CCD V light curve of HV 2241, together with some observations in the B band. We analysed our photometric data jointly with previously published radial velocities by means of the Wilson-Devinney code, and derived new values for the physical parameters of this massive eclipsing binary system. We confirm that this system is semi-detached, with the secondary (less massive and less luminous component) filling its Roche-lobe. From our analysis, we estimate the following masses and radii for the components of HV 2241: $M_1 = 36.2 \pm 0.7\,\mathrm{M}_\odot$, $R_1 = 14.9 \pm 0.4\,\mathrm{R}_\odot$, $M_2 = 18.4 \pm 0.7\,\mathrm{M}_\odot$ and $R_2 = 13.7 \pm 0.4\,\mathrm{R}_\odot$. We review the spectral classification analysing HST and IUE data and discuss the temperature and the reddening for this star.

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TREATMENT OF INVERTED POPULATIONS IN RADIATIVE TRANSFER IN EXPANDING ATMOSPHERES OF HOT STARS

R.O.J. Venero[1] and J. Puls[2]

In this work we present tools for the treatment of radiation transfer in hot star winds with transitions between atomic levels with inverted populations. The Sobolev approximation as well as the comoving frame method are modified in order to suppress the problems that arise from inverted populations. Both treatments are incorporated to a NLTE code for spherically symmetric "unified atmospheres".

Inversions in the high level populations of H, He I and He II may occur in the outer regions of extended atmospheres of early-type stars. The degree of inversion is usually rather small however it may be enough to make the source function diverge, specially for the IR frequencies. Moreover, as optical depths become negative under inversion, factors of the kind $e^{-\tau}$ may produce numerical problems. A theoretical treatment of inverted levels has been proposed by Taresch et al. (A&A 321, 531, 1997) for the Sobolev approximation. They considered a correction for inverted levels in the interaction function U for winds with significant continuum opacity. We adopt their treatment in our calculations. In addition, in order to solve the line transfer in the comoving frame, we propose an easy way to avoid numerical problems by working in the z-space rather than the τ-space. In that way, we replace optical depths and source functions by the z coordinate and emissivities respectively. We included both correction methods into the NLTE code for "unified atmospheres" developed by the Munich group (see Santolaya-Rey et al. A&A 323, 488, 1997). The improved code for both the Sobolev and the comoving frame approximations, has been tested in an extensive grid of atmospheric models, with T_{eff} ranging from 30,000 K to 55,000 K in steps of 5,000 K and values of 3.0 and 4.0 for $log\, g$. The proposed methods satisfactorily overcome the above mentioned convergence problems.

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THE HOT TEMPERATURE REGION IN Be STARS

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We have analized the profiles of lines that originate in the Hot Temperature Region (HTR) that surrounds the photospheres of Be stars; as such we considered He II λ 1640 Å, Si IV λ 1393 Å and λ 1402 Å, C IV λ 1548 Å and λ 1550 Å and Al III λ 1854 Å and λ 1862 Å. We intend to study the UV spectra of all Be stars available through the INES system, but at present we have only gone through all B8 and B0 spectra and our preliminar conclusions are as follows:

1. The He II λ 1640 Å is completely in absorption for high effective temperatures and quite masked by emission in the cooler objects; the line behaviour seems related to the T_{eff} of the central star.

2. The Si IV do not change in profile in either hot or cool objects, but a remarkable change is detected in the equivalent width; therefore, some physical parameter of the HTR is related to the star's T_{eff}.

3. C IV is not measurable in later types due to blends.

4. There is no noticeable change in Al III lines; the Doppler profiles having, approximately, the same equivalent width in the extreme subclasses of Be stars.

5. The pole-on stars display Al III lines that are characterized by large equivalent widths.

We tentatively conclude that He II is formed at the base of the wind, the resonance lines of Si IV at the temperature maximum of the HTR and the resonance lines of Al III far away from the photosphere, on the descending branch of the temperature curve. Further evidence for this statement and the discussion on the relation between temperature and velocity curves are to be given in a subsequent paper.

ROTATIONAL VELOCITIES OF B STARS

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We measured the projected rotational velocities of 1092 northern B stars listed in the Bright Star Catalogue and calibrated them against the 1975 Slettebak et al. System. We found that the published values of B dwarfs in the BSC average 27% higher than those standards. Only 0.3% of the stars have rotational velocities in excess of two–thirds of the break–up velocities and the mean velocity is only 25% of break–up, implying that impending break–up is not a significant factor in reducing rotational velocities. For the B8-B9.5 V–III stars, the bimodal distribution in V can be explained by a set of slowly rotating Ap stars and a set of rapidly rotating normal stars. We do not know whether that explanation can apply to the B0–B7 stars because we do not know how to make use of our equivalent widths of λ4471 He I to identify abnormal stars. The rotational velocities of giants originating from late B dwarfs are consistent with their conservation of angular momentum in shells. However we are puzzled by why the giants that originate from the early B dwarfs, despite having three times greater radii, have nearly the same rotational velocities. We find that all B-type primaries in binaries with periods less than 2.4 days have synchronized rotational and orbital motions; those with periods between 2.4 and 5.0 days are rotating within a factor 2 of synchronization or are "nearly synchronized". The corresponding period ranges for A–type stars are 4.9 and 10.5 days, or twice as large. We found that the rotational velocities of the primaries are synchronized earlier than their orbits are circularized. For stars of various ages from $10^{7.5}$ to $10^{10.2}$ years the maximum circularized periods are a smooth exponential function of their ages.

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STUDY OF SPECTROSCOPIC VARIABILITY OF T TAU STARS

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We present results of a spectroscopic variability analysis of the four T Tauri stars RY Lup, T Cha, SR-9 and Wa CrA. All of them showed to be radial velocity variables with amplitudes in the range 2-10 km s^{-1}. Observations of RY Lup show good agreement with the variable circumstellar extinction model. For the remaining stars we found that spots model was the best representative of their behavior. However, the observed radial velocity variations can also be explained by the presence of a secondary binary companion, for which we estimate a lower limit of 20-50 Jupiter masses. We cannot confirm any particular explanation of the observed variability because of the small number of observations available at present (about 10-20 spectra per object). Further observations would be necessary in order to decide which model fits better the observational data.

STELLAR EVOLUTION OF MASSIVE STARS UP THE ASYMPTOTIC GIANT BRANCH

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The aim of this work is to show the evolution of massive stars with a full spectrum of turbulence convective mixing. We present results for stars with masses of 4.0, 4.5, 5.0, 5.5, 6.0, 7.0, 8.0, 9.0 and 10.0 $M_{\odot}$. We compute the evolution from these masses from the pre-mainsequence up to the Asymptotic Giant Branch (AGB). Several authors use a treatment with an instantaneous mixing for the convective regions, but we use a turbulence convective mixing that take account the convective region as a whole. We employed a nuclear rates with thirty isotopes and one hundred seventy five reactions.

This code has been written following the Kippenhahn, Weigert & Hofmeister method (Meth. Comp. Phys. 7, 129, 1967) to resolve the differential equations of stellar structure, independently of other authors. The equation of state (EOS) employed, take account an ideal gas with partial ionization (Saha's Law). We include the effects of the relativistic and non-relativistic degeneracy for electrons to a finite temperature. The radiative opacities employed are the OPAL opacities (Rogers, ApJ 412, 572, 1993; ApJ 456, 902, 1996), with metal abundance $Z = 0.02$. For the conductive opacities we compute the solid phase (Itoh, ApJ 285, 758, 1984; ApJ 285, 304, 1984; ApJ 322, 584, 1987 erratum) and liquid (Itoh, ApJ 275, 858, 1983). We consider the photo, para and plasma processes of neutrino emission according to Itoh (ApJ 339, 354, 1989) and strong degeneration by plasma processes (Itoh, ApJ 395, 622, 1992).

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SOLAR MOTION USING ALL HIPPARCOS

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A partir de los movimientos propios y paralajes de todas las estrellas del catálogo Hipparcos y usando un modelo propio de ajuste de funciones (Stock y Abad, 1988), se determina la existencia de un patrón sistemático en los movimientos propios de las mismas, que corresponde al movimiento solar, previa corrección por rotación diferencial galáctica (Mignard, 2000). Se observa la dependencia de la posición del ápex en coordenadas galácticas (l_A, b_A) y de la velocidad del Sol $V_{\odot}$ en km/seg, según el tipo espectral. En la siguiente tabla se muestran los resultados más importantes, π es la paralaje.

Muestra	l_A	b_A	$V_{\odot}$	σ_{l_A}	σ_{l_B}	$\sigma_{V_{\odot}}$
$\sigma_\pi < 3\pi$	$61^o.39$	$20^o.42$	21.96	$3^o.13$	$2^o.62$	3.72
Sp. Type A	$42^o.31$	$24^o.00$	16.25	$5^o.65$	$4^o.12$	4.81
Sp. Type F	$55^o.54$	$21^o.05$	19.08	$5^o.10$	$4^o.28$	5.27
Sp. Type G	$65^o.06$	$17^o.54$	27.28	$5^o.48$	$4^o.24$	7.79
Sp. Type K	$67^o.50$	$17^o.81$	27.28	$4^o.98$	$3^o.92$	6.27
Todo Hipparcos	$61^o.21$	$21^o.18$	24.18	$3^o.66$	$3^o.59$	4.60

Se obtiene una función continua que expresa el valor de $(l_A, b_A, V\odot)$ en función de la clasificación espectral de las estrellas.

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MULTIPERIODIC VARIATIONS OF THE BE STAR HD 127972

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Line profile variations (lpv) in the HeIλ667.8 nm line were detected in HD 127972 by means of high resolution and S/N ratios of spectroscopic observations obtained at the OPD/LNA Observatory, Brazil (S/N = 100-300; R = 60000). They were interpreted in terms of nonradial pulsations (nrp). The stellar fundamental parameters were obtained using the BCD spectrophotometry, which were interpreted with models of rapidly rotating stars. This enabled us to estimate the stellar rotational frequency.

Time analysis of lpv patterns was performed using the CLEANEST algorithm, which furnished the frequencies: 0.61 c/d, 1.48 c/d ($\ell = 3$), 3.81 c/d ($\ell = 5$), 5.31 c/d ($\ell = 5$), 9.24 c/d ($\ell = 7$) and 10.35 c/d. If the 10.35 c/d frequency is considered to be the first harmonic of 5.31 c/d, the corresponding parameters for $\nu = 5.31$ c/d are $\ell = 5$, $|m| = 4$. Time analysis of V/R variations casts two frequencies: 0.6 c/d and 2.2 c/d. We suggest that the 0.6 c/d frequency obtained from lpv and V/R is probably due to the CE. The light curve (HIPPARCOS photometric data from 1990 to 1992) furnished the frequency $\mathbf{f}_{\rm phot} = 1.55$ c/d.

From the observed (λ_1, D) BCD parameters, $V_{\rm e} \sin i = 310$ km s^{-1} and models of rapidly rotating stars we obtained: $\log T_{\rm eff}(\Omega, i) = 4.294$; $\log L_{\rm eff}(\Omega, i)/L_\odot = 3.630$; $\log g_{\rm eff}(\Omega, i) = 3.83$; $\Omega/\Omega_{\rm c} = 0.9$; $M = 8.3\ M_\odot$; $i = 52^o$; $R_{\rm e}(\Omega) = 6.0\ R_\odot$. These values imply that the rotational frequency is: $\mathbf{f}_{\rm rot} = 1.29$ c/d, which is 20% smaller than $\mathbf{f}_{\rm phot}$. This frequency has not been found in our data, but it was observed previously by Janot-Pacheco et al. (1999, A&AS 137, 407).

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FUSE: DISTANCE DETERMINATION AND ISM TOWARDS V767 CEN

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New spectra have been obtained for the pole-on Be star V767 Cen (HD 120991) using the Far Ultraviolet Satellite Explorer (FUSE). We give a complete description of the spectral region $\lambda\lambda$ 920-1180 Å. Interstellar molecular bands and interstellar atomic lines are prevailing, which strongly lower the stellar energy distribution. We produce a synthetic spectrum of the ISM to determine the column densities of several elements (H_2, HI, NI, OI). Using the column densities, we locate the star relatively to the nearby interstellar clouds and estimate its distance by comparing the observed far-UV fluxes to the theoretical spectrum, which also accounts for the gravitational darkening due to the stellar fast rotation. From the column density of neutral hydrogen we determined the E(B-V) = 0.06 mag due only to the ISM medium. Rotationally modified synthetic stellar spectra in the FUSE+IUE+visible spectral ranges for $\Omega/\Omega_{\rm c} = 0.8$ enabled us to obtain the following stellar fundamental parameters of the homologous rotationless star: $T_{\rm eff} = 22000$ K; $\log g = 3.7$ dex; $i = 15^o$. The distance determined $d = 834 \pm 20$ pc using the far-UV spectrum, which does not vary while the visible does undergo strong changes, is in agreement with the characteristics of the ISM absorbing matter distribution towards the star and with the detecting limits of the HIPPARCOS satellite. This distance estimate has to be considered as the most accurate available at the moment.

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SPECTRAL CLASSIFICATION OF STARS WITH THE B[E] PHENOMENON

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Stars in different evolutionary stages and/or environments can show the B[e] phenomenon: forbidden emission lines in the visible spectral range and strong IR flux excess. A quick look at the list of known B[e] stars (Jaschek & Egret 1982, CDS-SP N^o 4) reveals that the "B[e] phenomenon" concerns objets that may show properties of "classic" Be stars, supergiants, symbiotics, etc. Lamers et al. (1998, A&A 340, 117) suggest to classify these objects into five classes according to different physical characteristics of the central stars and the circumstellar matter: sgB[e] (supergiants), HAeB[e] (pre-main sequence stars), cPNB[e] (compact planetary nebulae), SymbioticB[e] and unclB[e] (unclassified B[e] stars). In order to establish possible relations between the stellar evolutionary stage and the presence of the B[e] phenomenon, reliable fundamental parameters of these objects must be determined, which in most cases are still unknown. With this aim we obtained spectra of low resolution in the spectral region of the Balmer discontinuity of stars presenting the B[e] phenomenon. The spectra were obtained in March 2001 with the Boller & Chivens spectrograph at Complejo Astronómico El Leoncito (CASLEO) in Argentina. We obtained a preliminary spectral classification of

the observed stars in the BCD (Barbier-Chalonge-Divan) system (Cidale et al. 2001, A&A 368, 160). From the measured parameters, which are model independent, we shall derive stellar fundamental quantities like $T_{\rm eff}$, $\log g$ and $M_{\rm bol}$, which will help to establish possible relations between the stellar evolutionary stage and the presence of the B[e] characteristics.

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NEW V*SINI* DETERMINATIONS AND PHYSICAL PROPERTIES OF CIRCUMSTELLAR ENVELOPES IN BE STARS

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From Hγ, He I λ 4471, and Mg II λ 4481 line profiles obtained in a 10 year observing period of 116 Be stars, we derived new estimates of $V\sin i$ as well as several parameters related to the absorption and/or emission components. From those related to the Hγ line emission we investigated the structure of the nearby environment of the central star. From the best fit of non-LTE, full limb-darkened model line profiles to the observed He I λ 4471 lines, we determined the $V\sin i$. The fit was achieved by allowing for non uniform distribution of $(T_{\rm eff}, \log g)$ on the stellar surface induced by the rapid rotation. This method produced $V\sin i$ estimations which by definition are in the new Slettebak's et al. (1975, ApJS 29, 137) system. We found that all program Be stars have nearly the same ratio of angular velocities: $\omega = \Omega/\Omega_{\rm c} = 0.8$ ($\Omega_{\rm c}$ is the critical angular velocity). Using $\omega = 0.8$ we determined the inclination angle i of the stellar rotation axis in all program stars. From the study of the Hγ line emission characteristics against i we concluded that: 1) its emission-forming regions should not be strongly flattened; 2) the extent of the Hγ formation region is $R_{\rm f} \simeq 2.5 \pm 1.0 R_*$; 3) its density distribution is characterized by $\rho \sim R^{-\alpha}$ with $\alpha = 2.5^{+2.2}_{-0.6}$; 4) the density contrast in the circumstellar envelope near the star is not higher than $\rho({\rm equator})/\rho({\rm pole}) \simeq 5$. The separation between the emission peaks, $\Delta_{\rm p}$, and the full width at half maximum, $\Delta_{1/2}$, are sensitive both to kinematical effects and to the line optical depth. This confirms that Huang's (1972, ApJ 171, 549) relation overestimates the Balmer line emission formation region.

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FUNDAMENTAL PARAMETERS OF BE STARS TAKING INTO ACCOUNT THEIR FAST ROTATION

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Rotationally induced geometrical deformation of a star and the non uniform surface temperature distribution, which make stellar spectral type aspect angle dependent, produce significant effects on the fundamental parameter determination and, in particular, on the rotational frequency estimation. These effects are studied in a sample of 10 Be stars seen nearly equator-on. The studied stars have masses $M = 6$ to $18 M_\odot$ for which we have found, if rotation is not taken into account, that their masses are underestimated by $\delta M = -1.2 \pm 0.8 M_\odot$ and their radii by $\delta R = -0.5 \pm 0.2 R_\odot$. This carry an overestimation of the rotational frequency by 8 ± 1 % on average. For each star we determined the ratio $\omega = \Omega/\Omega_c$ and the inclination angle; on average we have: $\omega = 0.80 \pm 0.05$ and $i = 68^o \pm 3^o$. This allowed us to estimate their "true" rotational frequency ($f_{\rm rot}$ cycle/day), which can be compared to those obtained from time series analysis of spectral variations. The comparison of $f_{\rm rot}$ with the frequency of periodic photometric variations ($f_{\rm ph}$) shows that: $f_{\rm ph}/f_{\rm rot} = 1.5 \pm 0.5$, which means that we can hardly think always of $f_{\rm ph}$ as representing $f_{\rm rot}$. By neglecting the rotational effects, the stellar ages can be overestimated on average by $\delta\tau_o/\tau_o = 0.8 \pm 0.5$. The ages of the stars are in the range $0.3 < \tau_o/10^7 < 4.2$ yr, which indicate that the stars have been probably formed as fast rotators, rather than they acquired the high rotation later on due to evolutionary effects.

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MULTIPERIODICITY AND NRP IN BE STARS

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High resolution (20000-60000), high signal-to-noise (S/N $>$ 250) spectroscopic data on bright Be stars have been obtained in the Laboratório Nacional de Astrofísica (Brazil), roughly 4 times per year during the last 10 years and through multi-site campaigns in the frame of a joint program between Departamento de Astronomia - IAGUSP (Brazil) and DASGAL - Observatoire de Paris-Meudon. The aim of this program is to search for rapid ($f > 1$ c/d) line profile variability (lpv) and/or variability of classical line parameters (RV, EW, FWHM, V/R). Time analysis is performed with the help of the Sequential CLEANEST, Restricted Local CLEANEST (de Souza Jr. et al. 2000, IAU Coll. 175, ASP. Conf. Ser. 214, 276), Fourier-Doppler Imaging, Least-Squares and CLEAN methods. Multiperiodicity in the $f \sim$ 1-20 cycles/day frequency range is found in a number of objects. It is interpreted in terms of the nonradial pulsation model (nrp). Typical mode degree/azimulthal ($l/|m|$) numbers are found in the range 1-8. Season-to-season variations in frequency and line intensities have been found which could imply some link between nrp and mass loss episodes.

Star	f	l-$\|m\|$
α Eri	1.3-9 c/d	2-4
ζ Oph	7.2-26 c/d	3-7
η Cen	1.3-15 c/d	1-8
ω Ori	1.03 c/d	2-3
EW Lac	1.4-3.2 c/d	2-2
66 Oph	2.2-4.1 c/d	2-4

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EL REGISTRO DE LA OBSERVACIÓN DE UNA EXPLOSIÓN DE SUPERNOVA REALIZADO POR TEOTIHUACANOS EN EL SIGLO IV D. C.

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Es bien conocido el papel fundamental que jugó la Astronomía en la civilización mesoamericana. Una de las culturas más desarrolladas y extendidas en el Altiplano mexicano fue la teotihuacana. Además de orientar grandes estructuras arquitectónicas hacia eventos celestes, los teotihuacanos idearon los llamados marcadores o cruces punteadas. Se trata de dos círculos concéntricos, por cuyo centro pasan dos ejes perpendiculares entre si. Lo anterior tallado en rocas o en estuco de pisos. Estos marcadores se encuentran en gran parte de Mesoamérica, desde Durango hasta Honduras, en los estratos teotihuacanos. En la ciudad teotihuacana de Xihuingo, a unos 35 km. al noreste de Teotihuacan se ha localizado una gran densidad de marcadores. Junto a cada marcador se labraron además numerosos petroglifos con diversos temas. Aparecen representaciones del Sol, la Luna, fechas calendáricas, deidades, cuentas, etc. Al considerar las direcciones definidas por la línea que une a los centros de cada par de marcadores se ha encontrado que existen direcciones relacionadas a eventos celestes solares y planetarios. Si se toma en cuenta la línea que une al marcador, situado en la cúspide del cerro más alto del sitio, con mayor número de círculos, con el marcador más cercano a él, obtenemos una dirección muy significativa. Cabe hacer notar que los petroglifos asociados a este último marcador representan una fecha, un diseño de una estrella de cinco puntas con doble círculo continuo en su interior y una cara. Según el intervalo temporal de ocupación del sitio, tal dirección señala, justamente, el punto donde surgió en el año 393 D.C. una gran supernova registrada en la constelación del Escorpión por fuentes chinas. Esta representación, fijando temporalidad y dirección, es, posiblemente, la primer supernova conocida registrada en Mesoamérica.

EVOLUTION OF HELIUM CORE WHITE DWARFS WITH DIFFERENT METALLICITIES

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We present evolutionary calculations for helium core white dwarfs (HeWD) covering the range of masses of interest for these objects and taking into account two different initial metallicities for their progenitors. The values chosen, Z=0.001 and Z=0.0002, are appropriate to simulate progenitors located in low-metallicity globular clusters, where HeWDs are being discovered with the new generation of telescopes. The calculations were performed with the evolutionary code developed at the Observatorio Astronómico La Plata and take into account element diffusion in a self consistent way with evolution. As reported in Althaus et al. (MNRAS 323, 471, 2001) we find that there is a threshold in mass above which models experience some hydrogen shell flashes induced by element diffusion. After these flashes the hydrogen envelope is thin in the sense that no relevant nuclear burning is produced, and the HeWDs cool down fast. On the contrary, below this threshold models do not suffer from any flash and stable hydrogen burning dominates the energy budget of the star, which then cools down very slowly. The different initial metallicity determines the threshold value: for Z=0.001 we find it to be ≈ 0.21 $M_\odot$ while for Z=0.0002 it is ≈ 0.25 $M_\odot$. As a result, cooling ages are strongly dependent on the mass as well as on the metallicity of the progenitor and this must be taken into account when using theoretical models to fit the observations of these objects. A non-gray model atmosphere (Rohrmann, MNRAS 323, 699, 2001) was coupled to the evolutionary code. We have obtained color indices for the grid of models consistently with the cooling of these objects, making comparison with observations very straight forward. Standard color indices (U-B, B-V, V-R, etc.) are tabulated in a set of files that can be downloaded from *http://www.fcaglp.unlp.edu.ar/~serenell* or upon request to the authors.

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THE MG II LINES AS INDICATORS OF SOLAR AND STELLAR ACTIVITY

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Given the impact that solar activity may have on terrestrial climate, it is important to know the range of variation of the solar constant in scales of decades to centuries. Systematic observations of solar type stars can help us to understand this issue. Knowing the levels of stellar activity we can constrain the activity of the Sun in the past, and so assess the influence that changes in the solar emission could have had on the earth's climate. In this work, we study how the Mg II h and k lines in the UV can be used for these studies. These lines are formed in a similar way to the Ca II H and K lines, which are the most frequently used for this kind of work. However, the Mg lines present much stronger emission peaks, and are therefore more sensitive to the activity levels. We build an index X_{hk} of the emission in the core of these lines, in a similar way to the Ca II H and K index S_{HK} used at Mount Wilson Observatory, and we calibrate these two indexes, finding a linear relation (correlation r= 0.86) between S_{HK}-S_{min} and X_{hk}-X_{min}, where S_{min} and X_{min} are the minimum values obtained for inactive stars . For this calibration, we use 123 high resolutions images from IUE, for a sample of 26 F5-K3 main sequence stars, and nearly simultaneous measurements from Mount Wilson. In this way, we plan to use UV images to compute the X_{hk} index, and convert it to S_{HK}. We will be able then to use UV observations of Mg II and visible observations of Ca II jointly, to extend in time the period of the observations. In the future, we plan to analyze UV images from the IUE and Hubble satellites, for a sample of twenty solar type stars, some of which have been recently reported as having planetary systems. Combining these with our observations at CASLEO, we will be able to study the activity of these stars in a much longer period.

REANALYZING THE ZANSTRA DISCREPANCY

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The temperature of the central stars in planetary nebulae is generally given by the Zanstra method. This method provides two values for the temperature of a single star: the one obtained from the H recombination lines, T_Z(H), and another from the He recombination lines, T_Z(He II). The ratio of these two values can be much different from unity, leading to the well-known "Zanstra discrepancy". The discrepancy is higher for lower temperature stars and the method does not reproduce the high values for the stellar temperature suggested by stellar evolutionary models. The causes of the Zanstra discrepancy have been extensively discussed in the literature:

(a) optical effects, i.e., nebulae exhibiting a Zanstra discrepancy would be optically thin to photons ionizing H, yet optically thick to those ionizing He^+;

(b) differential dust absorption in the nebula;

(c) the stellar continuum differing from the usually assumed black-body spectrum; for example, an excess of photons with energies beyond the He^+ ionization potential would result in a high He II Zanstra temperature.

In this work we show, quantitatively, that the details of the distribution of the H and He II Zanstra temperatures are mainly explained by an optical depth effect; in particular, the fact that the discrepancy is larger for low stellar temperatures. The results also show that for high stellar temperatures the He II Zanstra temperature underestimates the stellar temperature, even for high optical depths. The stellar temperature, as well as the optical depth, can be obtained from a plot ZR = T_Z(He II)/T_Z(H) vs. T_Z(He II). Departures from a black-body spectrum and the He abundance in the nebulae also affect the value obtained for the stellar temperature, but the effect is not so important. For nebulae of very low optical depth and/or high stellar temperature the distribution ZR vs. T_Z(He II) only provides lower limits for T_*. In order to obtain better values for the optical depth and T_*, we propose the use of the line intensity ratio He II/He I versus T_Z(He II) diagram.

ASYMMETRIC TYPE IA SUPERNOVA EXPLOSIONS

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The thermonuclear combustion front of a type Ia supernova, in the wrinkled flamelet regime can be described by a fractal model of combustion. In this model the flame velocity is given by a fractal scaling law depending only on one parameter: the fractal dimension. It is not fully understood yet if this scaling law is also applicable in the turbulent combustion regime up to the distributed burning regime, when a transition to detonation in the SN Ia is believed to occur. In a recent work, we have described the effects of magnetic fields on the fractalization of the turbulent front that has brought a new observational constraint to the understanding of the turbulent combustion regime (Ghezzi, de Gouveia Dal Pino & Horvath, ApJ 548, L193, 2001). We have found that for supernova progenitors with surface magnetic field strengths up to $10^8 - 10^9$ G (and magnetic fields near the center roughly 10 times greater), asymmetries in the velocity field higher than $10\% - 20\%$ are produced between the magnetic polar and the equatorial axis of the star. This can be related with recently detected asymmetries in very young SN Ia remnants through polarization measurements (e.g., SN 1996X, SN 1999; Wang, Wheeler & Höflich, ApJ 476, L27, 1997; Wang et al., ApJ 550, 1030, 2001). In the present work, the asymmetry dependence with the composition of the progenitor is also examined in detail.

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ATOMIC LEVELS POPULATION UNDER NLTE CONDITIONS

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The aim of this work is to analize the behavior in the stellar atmospheres of the atomic energy levels population. In this way, we set the statistical equilibrium equations under NLTE conditions, by taking into account all the atomic processes which could occur in

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a partially ionized plasma. For the needed cross sections and rate coefficients of hydrogenlike ions we have used the usual expressions. In the case of no-hydrogenlike ions we adapted those expressions by considering effective principal quantum numbers and effective charges. We obtained, for atomic species with astrophysical importance, the population distributions against parameters such as electron temperature, radiative temperature, electron density, geometrical dilution factor and mass loss rate, which are used to analyze stellar atmospheres.

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THE MASSIVE DOUBLE-LINED O-TYPE BINARY HD 165052

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We have presented a detailed study of the O-type binary system HD 165052 based on recent high-resolution CCD spectroscopic observations. We have redetermined the spectral types of both binary components, resulting in the spectral classification of O6.5 V + O7.5 V. We have also detected the C III λ5696 emission in both spectral components, this line being stronger in the primary. We have determined an improved set of orbital elements using our high-resolution optical spectra. We thus found a slightly eccentric orbit ($e = 0.09$) with a period of 2.95510 days, which is consistent with the previous determination from archival *IUE* observations performed by Stickland et al. (The Observatory 117, 295, 1997). We obtained for the binary components velocity semiamplitudes of 94.8 ± 0.5 km s^{-1} and 104.7 ± 0.5 km s^{-1}, resulting in a mass-ratio $Q = 0.9$. Significant evidence for apsidal motion in i HD 165052 was also presented. Finally, we investigated the interaction of winds in HD 165052 through examination of a number of effects that provide evidence for colliding winds in close binary systems. We confirmed the presence of phase-locked variations of the X-ray emission, obtaining an X-ray lightcurve which shows a twin-peaked structure with two maxima, one near each quadrature phase, in good agreement with current models for O+O systems with equal stellar winds. We also detected the presence of the Struve-Sahade effect in the He I absorption lines, reinforcing the idea that colliding winds could be in fact significant in HD 165052.

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FORBIDDEN COMPONENTS IN THE LINE SPECTRUM OF HE I. I. SURVEY OF B STARS IN THE SOUTHERN HEMISPHERE

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It is an observational fact that most of the He lines are affected by Stark-effect and that the presence of forbidden transitions of He I is often observed in the spectral types B2-3 V. The He I line λ4471 is typically used for the determination of the stellar projected rotational velocity ($V \sin i$) by fitting computed profiles to the observed ones. However, the line profile calculation of He I λ4471 includes the presence of the forbidden component at λ4470 and the wing broadening-function due to density effects (cf. Slettebak et al., ApJS 29, 137, 1975). Merrill (PASP 60, 326, 1948) reported the presence of strong forbidden components of He I in the spectra of B supergiants and found that the residual velocities of the He I lines, as compared to other lines, do not agree at all with the Stark-effect predictions. In order to investigate the behaviour and the origin of the forbidden components of He I we have carried out a survey of the spectral region $\lambda\lambda 4460 - 4490$ in southern B0-B5 stars of different luminosity classes selected from the Bright Stars Catalogue. The analysis of He I, Mg II and O II lines present in our observations, allows us to establish several correlations that can be used as criterion for the detection of the He I forbidden component λ4470. At present we have analysed 85 stars with low $V \sin i$. We find that the forbidden component He I λ4470 appears in both supergiants and main sequence stars, being sometimes fairly strong in the former.

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ELEMENTAL ABUNDANCE STUDIES OF CP STARS. THE HELIUM-WEAK GROUP I. HD 19400, HD 34797 AND HD 35456

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Fine analysis of the abundances of the helium-weak stars HD 19400, HD 34797 and HD 35456 are presented using the latest version of ATLAS code that have the same bulk metallicity as the deduced abundances. The stellar spectra were obtained by F. Leone with "Jorge Sahade" 2.15-m telescope at Complejo Astronómico El Leoncito (CASLEO) equipped with a REOSC echelle spectrograph and a TEK 1024x1024 CCD detector. Five spectra of each star were obtained. They were reduced using IRAF. Compared with the Sun we can observe that C, Mg, and S are underabundant in the He-weak stars. Ti is overabundant by a factor 34, 55 and 52, in HD 19400, HD 34797 and HD 35456 respectively. Cr and Sc are overabundant in the He-weak stars by a factor equal to 15 and 25 respectively. Fe is overabundant by a factor between 5 and 10. Ni is overabundant 2 times with respect to the solar abundance. The heavy elements ($Z > 39$) show an overabundance in all the He-weak stars studied.

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TIME DEPENDENT DIFFUSION IN ZZ CETI STARS: ASTEROSEISMOLOGY OF G117B-15A

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We study the structural characteristics of the ZZ Ceti (variable DA white dwarf with hydrogen-dominated atmosphere) G117B-15A by applying the methods of asteroseismology.

When applied to pulsating white dwarfs stars, asteroseismological techniques allow the astronomers extract information about the stellar mass and the stratified outer layer structure. It is the aim of this work to perform a new asteroseismological fitting to the period structure present in the ZZ Ceti G117-B15A (which exhibit periods $P=$ 215.2, 271 and 304.4 s) computing non-radial eigenmodes of evolutionary white dwarf models in which time dependent element diffusion is properly accounted for. For this work we have employed the same evolutionary-pulsational code and physical ingredients as in Córsico & Benvenuto (A&ASS 2002 to be published). In particular for the diffusion processes we considered gravitational settling, chemical and thermal diffusion as in Althaus & Benvenuto (MNRAS 317, 952, 2000). We have considered evolutionary models with masses of 0.50, 0.525, 0.5375, 0.55, and 0.60 $M_\odot$. The mass fraction embraced by the outermost hydrogen layer has been assumed in the range of $-7.4 \lesssim \log(M_{\rm H}/M_*) \lesssim -3.8$. The internal carbon - oxygen chemical profile corresponds to that calculated by Salaris et al. (ApJ 486, 413, 1997). In computing the g-modes of our white dwarf models, we have considered only dipolar ($\ell = 1$) eigenperiods with radial order $k = 1, \cdots, 4$, which correspond to the observed periods in G117-B15A. After a detailed and extensive asteroseismological fitting process (which is not described here for reasons of space), we have arrived to the results summarized in the Table. Notably, the values of the effective temperature and stellar mass are in very nice agreement with those predicted by spectroscopic analysis by Koester & Allard (BaltA 9, 119, 2000). However, our asteroseismological parallax value is markedly greater than the inferred by astrometric techniques.

Quantity	Fitted model	G117-B15A
$M_*/M_\odot$	0.525	0.53 $^{(1)}$
$\log g$	7.85	7.86 ± 0.14 $^{(1)}$
$T_{\rm eff}$ [K]	11,790	11,900 ± 140 $^{(1)}$
$\log(M_{\rm H}/M_*)$	-3.83	...
$\log(M_{\rm He}/M_*)$	-2.00	...
Parallax [mas]	15.89	10.5 ± 4.2 $^{(2)}$

References: (1) Koester & Allard (2000), (2) van Altena et al. (Gen. Cat. of Trig. Parallaxes, 1994)

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PROPERTIES OF BE STAR CIRCUMSTELLAR ENVELOPES DEDUCED FROM FE II EMISSION LINES

M. L. Arias[1], J. Zorec[2], L. Cidale[1], J. Chauville[3] and D. Ballereau[2]

Fe II emission lines in the optical spectral range ($\lambda\lambda$ 3900-8000 Å) of χ Oph (HD 148184) obtained at Complejo Astronómico El Leoncito (CASLEO), Argentina, with the REOSC spectrograph (R = 11500, S/N = 450) were analysed using the "self absorption curve" method (SAC, Friedjung & Muratorio 1987, A&A 188, 100). We concluded that the Fe II emission lines are optically thick, contrarily to what is currently assumed in the literature. We estimated the excitation temperature of the permitted Fe II line formation region, $T_{\rm r} = 11000 \pm 200$ K, and the dimension of this region, $R/R_* = 1.5 \pm 0.4$, which is twice as smaller than that deduced from Huang's (1972, ApJ 171, 549) kinematic relation. This implies that the Fe II emission line profiles not only depend on the kinematical properties of the region where they are formed, but that they also depend on its optical depth. As the inclination angle of the rotational axis of χ Oph is $i \simeq 25^o$ (Chauville et al. 2001, A&A in press), the opacity $\tau \sim 2.3$ of Fe II lines at $\lambda \sim 5950$ Å implies that the circumstellar envelope can hardly be flat disc shaped. From the fact that the slope of the SAC curve obtained is $\partial Y/\partial X = -0.74$ ($Y = \log[F_{\rm ul}\lambda^3/g_{\rm l}f_{\rm ul}]$; $X = \log[g_{\rm l}f_{\rm ul}\lambda]$) over a large range of (X, Y) values and that the column densities of different Fe II line multiplets can not be the same, the density structure of the line formation region is probably irregular.

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RESEARCH ON THE PROPERTIES OF A GROUP OF SOUTHERN B-TYPE EMISSION-LINE STARS

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The B[e] stars are "peculiar" emission-line stars with IR excesses due to hot circumstellar dust, i.e., they are early-type emission lines stars with low-excitation lines, forbidden lines of [FeII] and [OI], and hot dust (T 500 - 1000 K) visible in the near and mid infrared. The continuum distribution is similar to an early-type star. We plan to describe the spectra of a sample of southern stars that present this phenomenon, with the purpose of obtaining more information about the characteristics of this inhomogeneous group of objects and to detect possible variations of the spectra. The spectroscopic observations are being collected with a REOSC èchelle spectrograph and a TEK 1024 x 1024 CCD, attached to "Jorge Sahade" 2.1 meter telescope at Complejo Astronómico El Leoncito, San Juan, Argentina. The resolution of the spectra is around 0.14 Å /pix. The blue spectra cover a spectral region between 3700 and 5800 Å while the red spectra cover between 6000 and 8000 Å . In this presentation, we study the stars HD 87643 and CD -48^o 7859. We have concluded that HD 87643 is undergoing a flux of ejected matter at a high velocity and a flux at low velocities responsible of the intense FeII lines. With respect to CD -48^o 7859, we need to get more observations in order to derive some information concerning spectral variations and to analyze the ejection of matter. The study of this two stars and other three obtained with the same equipment and analyzed in the same way (HD 85567, Hen 3-1398 and Hen 3-340, confirms that B[e] stars is not a unique class, but rather a group of stars that share the property of the "the B[e] phenomenon".

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H LINE FORMATION IN THE IR SPECTRUM OF BE STARS

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Based on models for extended atmospheres of B type-stars, we analyzed the formation of H lines corresponding to Brackett and Paschen series. The atmospheric model consists of a photosphere in radiative and hydrostatic equilibrium and superimposed spherical layers that expand monotonically. The photosphere is described by Kurucz's (ApJS 40, 1, 1979) models and the temperature structure of the expanding layers is represented by a rise of temperature until it reaches a maximum value, of a few times the effective temperature, and then drops down to around 10,000 K. The NLTE line radiative transfer problem is solved in the co-moving frame for a spherically symmetric configuration by applying the method proposed by Mihalas & Kunasz (ApJ 219, 635, 1978). A ten level atom model for H was assumed. The computed IR hydrogen lines have collision dominated source functions, so they are adequate for stellar activity detections. The strength of Paschen and Brackett lines are quite sensitive to the location of the high temperature region. The velocity field determines the shape of the profile; single or double-peak emission structure are often obtained. P_β and B_γ lines react in a quite similar way to variations of model parameters. This method is used to infer the physical conditions of circumstellar envelopes by means of a direct comparison between observed and computed line profiles.

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OPTICAL AND INFRARED LIGHT CURVE OF SN2000CX

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We have measured the optical and infrared light curve of SN2000cx, a Type Ia supernova located in the outer part of an S0 galaxy, using observations taken at CTIO telescopes. We expected for it to have little reddening, but the $B_{max} - V_{max}$ method implies a larger value of color excess $E(B-V) = 0.176 \pm 0.104$. Other standard methods based on matching this light curve with a "typical" type Ia SN (AJ 118, 1766, 1999; ApJ 539, 658, 2000) show an unphysical negative reddening. Finally, the light curve of this SN looks normal but we found that this object has intrinsic colors much different than we expected. This tells us that the relations between colors and decline rate are not as universal as we initially thought.

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DYNAMICAL STRUCTURE OF A STELLAR ENVELOPE UNDER MAGNETIC AND RADIATION FIELDS.

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In this paper we show a perturbative dynamical analysis of the cool envelope of Be stars under magnetic induction, radiation and gravitational fields. We consider the magnetohydrostatic model by Ringuelet & Iglesias (RI) (ApJ 369, 463, 1991) as a first order approximation. For small perturbations this method gives a density distribution similar to that obtained by the RI model. It shows an equatorial bulge and a lower density at the poles, so the cool envelope covers the poles in contrast to the disk model (Bjorkman & Cassinelli, ApJ 409, 429, 1993). Our model is a second approximation, we consider the action of the velocity over the induction line structure as a perturbation. These resulting lines determine the density distribution. At first, we compute the magnetic induction field in the static case; the shape of its lines allows us to decide new values for some parameters which are very important for the dynamical analysis. Then, the problem is approached by means of the stream functions methodology (Agim & Tataronis, J. Plasma Phys. 34, 337, 1985). This methodology allows a simpler treatment of the magnetohydrodynamic equations for the stationary case with a

symmetry. Finally, in order to solve the second order inhomogeneous equation in partial derivatives that results, we make a code obtaining the density behaviour. For small initial velocities at the poles lower than 10 km/sec, the density distribution is similar to that obtained by the RI model. But for initial velocities at the poles of the order of 25 km/sec, the numerical results show a lower density region at the poles. The perturbative method can not be extended to initial velocities much higher than this value. Nevertheless, we do not obtain a thin disk like other authors. The density distribution obtained by the present model is in accordance with Fox's results (MNRAS 260, 525, 1993). The stellar winds does not accumulate material on the equatorial plane. This is another important result in contrast to the predictions of the "wind-compressed disk" model (WCD) of Bjorkman & Cassinelli (1993).

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THE EFFECTS OF ELEMENT DIFFUSION ON THE PULSATIONAL PROPERTIES OF ZZ CETI STARS

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We explore the effects of element diffusion due to gravitational settling and thermal and chemical diffusion on the pulsational properties of DA white dwarfs.

Pulsating DA white dwarfs (WD) or ZZ Ceti stars pulsate in the instability strip corresponding to 12500 K $\gtrsim T_{\rm eff} \gtrsim$ 10700 K. Their periodicities are due to spheroidal, non-radial g-modes of low harmonic degree ($\ell \leq 2$), driven by the $\kappa - \gamma$ mechanism working in a partial ionization region near the stellar surface (Winget et al., ApJ 252, L65, 1982). The periods (P) are found within a range of 100 s $\lesssim P \lesssim$ 1200 s and photometric amplitudes reach up to 0.30 magnitudes. In this work we perform new evolutionary - pulsational calculations in ZZ Ceti stars. We carry out time-dependent diffusion calculations for multicomponent plasma in a self-consistent way with stellar evolution. For this end, we have employed our WD evolutionary code (Benvenuto & Althaus, MNRAS 293, 177, 1998) supplemented with the routines that compute the effects of gravitational settling, and chemical and thermal diffusion (Althaus & Benvenuto, MNRAS 317, 952, 2000). In order to compute the g-modes of the WD models we have coupled our evolutionary code to our new pulsational code described in Córsico & Benvenuto (A&ASS 2001 to be published). Specifically, we have evolved a 0.55 $M_\odot$ WD model with an internal carbon - oxygen chemical profile corresponding to that calculated by Salaris et al. (ApJ 486, 413, 1997). Such a model has hydrogen and helium mass fractions of $M_{\rm H}/M_* = 10^{-4}$ and $M_{\rm He}/M_* = 10^{-2}$ respectively. Also, in order to make a detailed comparison of predictions of our models with those found in previous studies, we have carried out additional pulsational calculations in a sequence of models in which the diffusive equilibrium in the trace element approximation (for details, see Tassoul, Fontaine & Winget, ApJS 72, 335, 1990) at the hydrogen-helium interface is assumed. When the models reached $T_{\rm eff}$ = 14000 K the pulsational calculations were started. Specifically, periods for $\ell = 1$ modes in the range of 100 s $\lesssim P \lesssim$ 1000 s were computed. Pulsational calculations were stopped at $T_{\rm eff}$ = 10000 K. The $\dot{P}$ (the temporal derivative of the period) values were obtained by numerical differentiation. Next, we compare the results obtained in both set of calculations. We found that the greatest relative differences encountered are of $\approx$ 20% for $\dot{P}$ and of $\approx$ 5% for P. The differences arise mainly from the very different shape of the interface profile resulting from these two treatments. These results indicate that, as models with time dependent element diffusion are more physically plausible, these should be taken into account in asteroseismological studies. Also, as $\dot{P}$ is modified, this approach should also be taken into account at using observed $\dot{P}$ values to infer the chemical composition of the WD core.

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IONIZATION AND MOLECULAR FORMATION IN THE ATMOSPHERE OF UX ANTLIAE

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UX Antliae is a variable star of the R Coronae Borealis type (Erro, Harvard College Obs. Bull. 913, 1, 1940; Kilkenny & Westerhuys, The Observatory 110, 90, 1990; Milone, Minniti & Paolantonio, Inf. Bull. Var. Stars N^o 3505, 1990); it is also an extreme population II object (Kilkenny & Westerhuys, 1990; Lawson et al, MNRAS 271, 919, 1994). Thus we are facing a hydrogen and metal-deficient star, whose carbon content, moreover, is slightly enhanced (i.e., a HdC mixture of population II) (Rao & Lambert, ASP Conf. Ser. Vol 96, 43, 1996). For such an anomalous composition, we attempted to analyze its ionization stage and its molecular formation for a diversity of electronic pressures and temperatures; results were compared to what is found in a solar mixture, in a metal-deficient one, and in a H-deficient C-rich mixture (not deficient in metals) (Merlo & Milone, A&ASS 2001, submitted). The main idea is - rather than to obtain in-depth information about very particular mixtures - to determine the evolution of physical variables (such as ionization stage, number of molecules and electrons per unit mass, etc.) as we switch from a "normal" solar mixture to a metal-deficient one, or to an extreme-He one, or to another extreme-helium, metal-poor one. For T >25000K and within the range of log P_e considered here, the log P_g vs. log P_e relations do not show large differences as we change from a HdC mixture to a HdCII mixture. For intermediate temperatures ($T \approx 12600$K), when He recombination ends, the HdCII mixture shows a marked deficiency of electrons, relative to the HdC mixture. For the lowest temperature we analyzed ($T = 6300$K), the electronic deficiency in the HdCII mixture is even larger than in a population II one; consequently, as the C deficiency is added to the electronic deficiency in the HdCII mixture, the formation of C^- is only marginal, and so is the C_2 formation.

MOLECULAR FORMATION IN STELLAR ATMOSPHERES

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Molecular formation is important in low-temperature stellar atmospheres. Usually, the calculation of the number of molecules is performed iteratively, beginning with a numerically important element. If only one element of the gaseous mixture is assumed to form molecules (e.g., H in a solar mixture, or C in a HdC one), an elegant procedure was devised, which allows the rigorous solution of the problem (Mihalas, Methods in Computational Physics, 7, 1, 1967, Academic Press; Stellar Atmospheres, 74, 1970, Freeman & Co). We show that the device as originally written, is, unfortunately, numerically unstable. Consequently, the method was analyzed in detail and the reason for the numerical instability was found: for relative high temperatures, a strong cancellation of terms occurs in the calculation of the number of molecules, and thas the result is very poorly determined; this condition propagates into the calculation of the electronic density, which also results as poorly determined. The difficulty was overcome by using a step-by-step procedure; the alternative method is shown to be correct and efficient, as it converges to the right value within a few iterations. Also, its applicability was extended to a HdC mixture, where it allows the simultaneous determination of the relative numbers of C, C^-, C_2, C_2^+, C^+, C^{++}, H, H^-, H_2, H_2^+ and H^+.

OPEN CLUSTERS OR THEIR REMNANTS: B AND V PHOTOMETRY OF NGC 1901 AND NGC 1252

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We provide CCD photometry in the B and V bands of the Galactic stellar groups NGC 1901 and NGC 1252. NGC 1901 is projected onto the young LMC disc, and it is often described as an open cluster. NGC 1252 as presented here is a stellar concentration at the southwest edge of Bouchet & Thé (PASP 95, 474, 1983) definition of NGC 1252, which is in turn a sparse collection of stars in a much larger field. NGC 1901 is conclusively a physical system, and we derive a reddening value E(B-V) = 0.04, a distance from the Sun $d_{\odot}$ = 0.45 kpc (Z = -0.23 kpc)

and an age 0.6 ±0.1 Gyr. NGC 1901 is dynamically comparable or more evolved than the Hyades. The present color-magnitude diagram of NGC 1252 suggests a turnoff and main sequence. We simulated the Galactic field color-magnitude diagram in the same direction and found it to be a poor match to that of NGC 1252 suggesting that the object is not a field fluctuation. We conclude that E(B-V) = 0.02 is compatible with the main sequence for an intermediate age, $d_\odot = 0.64$ kpc (Z = -0.46 kpc) and age 3±1 Gyr. NGC 1252 cannot be ruled out as a physical system with the available data. At any rate, NGC 1252 is not a classical open cluster, but it is consistent with the notion of an old open cluster remnant.

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FOTOMETRÍA CCD DE LOS CÚMULOS ABIERTOS HAFFNER 17 Y HARVARD 6

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Presentamos fotometría CCD de los cúmulos abiertos galácticos Haffner 17 (C0749-317) y Harvard 6 (Collinder 261, C1234-682). Las observaciones fueron llevadas cabo desde el Complejo Astronómico El Leoncito (San Juan, Argentina). El análisis de los diagramas color-magnitud permite derivar: para Haffner 17, una edad de $(1.3 \pm 0.3) \times 10^8$ años, $E(B-V) = 1.14 \pm 0.03$ y una distancia $r = 2.9 \pm 0.3$ kpc. Asignamos a Harvard 6 una edad de $(5.6 \pm 1.0) \times 10^9$ años, $E(B-V) = 0.27 \pm 0.03$ y $r = 2.7 \pm 0.3$ kpc.

Haffner 17 ($l = 247.70°$, $b = -2.53°$), fue observado en las noches del 3 de abril de 1998 y 24 de abril de 2001, con filtros $BVRI$. Harvard 6 ($l = 301.69°$, $b = -5.54°$), lo fue sólo en una noche, la del 4 de abril de 1998, en los filtros BV. Hemos ejecutado, en ambos casos, fotometría PSF (Stetson, PASP 99, 191, 1987); las estrellas estándar son las de Graham (PASP 94, 244, 1982). Estos cúmulos tienen muy pocos estudios previos. Hemos controlado nuestros datos BV con Pedreros (Rev. MexAA 36, 13, 2000, Haffner 17) y Gozzoli et al. (MNRAS 283, 66, 1996, Harvard 6). Las diferencias medias con las observaciones de Pedreros, a lo largo de $13 < V < 19$ y en el sentido: nuestras observaciones menos la publicada, son $\Delta V = 0.050 \pm 0.005$, $\Delta(B-V) = -0.070 \pm 0.011$. Esta discrepancias no son despreciables; cabe mencionar que nuestros datos, de distintos turnos de observación y resultados de transformaciones independientes, difieren en V a lo sumo 0.015 mag. En el caso de Harvard 6, la comparación es buena: $\Delta V = -0.016 \pm 0.017$, $\Delta(B-V) = 0.012 \pm 0.028$. Los parámetros citados al principio resultaron del ajuste de isócronas teóricas en los diversos diagramas color-magnitud convenientemente limpiados. En el caso de Haffner 17, las isócronas de Girardi et al. (A&ASS 141, 371, 2000) de metalicidad solar permiten estimar, además, los enrojecimientos $E(V-R) = 0.66 \pm 0.03$ y $E(V-I) = 1.41 \pm 0.03$. Con $R = 3.1$, tenemos $E(V-R)/E(B-V) = 0.58 \pm 0.03$ y $E(V-I)/E(B-V) = 1.25 \pm 0.04$. A partir de conteos de estrellas estimamos para el cúmulo un radio aparente de $2'$. Harvard 6 es un cúmulo viejo, y asumiendo la realidad de las estructuras observadas, e.g., las ramas gigante y subgigante y un pequeño clump, obtenemos los datos citados arriba con el ajuste de isócronas de metalicidad solar de Girardi et al. (2000). Otro ajuste aceptable es el de la isócrona de Bertelli et al. (A&ASS 106, 275, 1994) para 6.3×10^9 años. Estimamos para la parte central de este cúmulo un radio de 3–$4'$.

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MEMBERSHIP AND PROPER MOTIONS OF A LARGE SAMPLE OF OPEN CLUSTERS

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The open clusters constitute a system of objects of great value for the study of the dynamics of the Galaxy, because they span a relatively wide range of ages, and their age can be determined with more precision than any other spiral arm tracer, with the help of the HR diagram. They are key objects to understand the motion of spiral arms and of the moving groups of stars, to derive the rotation curve and to distinguish between star formation processes. To investigate the orbits of this system, it is essential to have at our disposal accurate proper motion and radial velocities. We determined proper motions of open clusters based on the Tycho2 catalogue (Hog et al., A&A 355, 27, 2000). 168 open clusters within 1 kpc were investigated and for 27 this is the first determination of membership and mean proper motion (Dias, Lépine and Alessi, A&A 376, 441, 2001).

We also discussed other 50 objects farther than 1 kpc. The statistical method of Sanders (A&A 14, 226, 1971) was applied to derive probable membership and the mean proper motion of the clusters are based on relatively large samples of stars for each cluster. A comparison with other values published in the literature assures the quality of our results. In this work we also present the first results of an observational program developed at the 0.6-m telescope (photometry and astrometry) and at the 1.6-m telescope (radial velocities) at Laboratório Nacional de Astrofísica (LNA-Brazil).

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CCD PHOTOMETRY OF THE OPEN CLUSTER NGC 2395

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We present preliminary results of the BVI CCD photometry of NGC 2395, an open cluster that has been poorly studied and for which the results obtained up to now are markedly different. CCD images in the field of the NGC 2395 (l = 205°, b = +14°), and in a comparison field located about 20′ away from it, were obtained with the 2.15–m telescope at CASLEO (Argentina) and the BVI filters. Member candidates are identified by means of proper motions from the Tycho–2 catalogue, and making use of the comparison field and of a galactic model. From the analysis of the color–magnitude diagrams we derive a colour excess $E_{B-V} = 0.23 \pm 0.02$ mag and a distance of approximately 700 ± 50 pc ($V_0 - M_V = 9.3 \pm 0.1$ mag). We conclude that NGC 2395 is thus located towards the galactic anticenter at about 170 pc above the Galactic plane, and has a galactocentric distance of 8.7 kpc. It is a rather poor (40 members) and sparse open cluster, with an angular diameter of 19′, that correponds to about 4 pc at the cluster's distance. The theoretical isochrones (Girardi et al., A&ASS 141, 371, 2000) that are in better agreement with the data correspond to solar metallicity and a range in age of 500 – 630 Myr; that is, it is a relatively old open cluster with an age similar to that of the Hyades.

ELEMENTAL ABUNDANCES IN CP STARS OF GALACTIC OPEN CLUSTERS

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The diffusion theory predicts the anomalous abundances seen in CP stars. Some ions sink in a stable atmosphere and other are pushed up. This process is time dependent. Should Silicon CP stars present an abundance pattern that depends on age?. We are trying to answer this question measuring abundances of CP stars belonging to open clusters with a span of ages. We have selected from Mermilliod's data base of open clusters, some Silicon stars among members of southern open clusters: NGC 3114 (log age = 8.09) Num. 24 (Teff = 10500 K, log g = 2.6:), Num. 25 (Teff = 12530 K, log g = 3.26) and Num. 108 (Teff = 12500 K, log g = 3.25); NGC 3532 (log age = 8.49) Num. 449 (Teff = 12540 K, log g = 3.87) and NGC 6087 (log age = 7.97) Num. 5 (Teff = 12600 K, log g = 4.02). The spectroscopic observations were performed with a REOSC èchelle spectrograph attached to "Jorge Sahade" 2.1 meter telescope at Complejo Astronómico El Leoncito, San Juan, Argentina. The detector is a 1024 X 1024 TEK and the 2-pix resolution is 0.28 Å . The spectra were reduced with IRAF using standard procedures. The effective temperatures and log g were determined using the Geneva photometry and, with these values, we chose the model atmosphere from Kurucz's models (private communications). We have used the code SPECTRUM and a routine call Blackwell to derive abundances starting from the equivalent widths of the lines measured. The code permits to derive abundances and microturbulent velocities simultaneously using Blackwell diagrams. We have checked the results with those obtained using the standard Kurucz's WIDTH code and we have obtained a perfect agreement. As this is an ongoing program, once more data become available for the whole range of cluster's ages, we will be able to discuss the statistical relation between the abundances of relevant atomic elements with age.

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AN IMPROVEMENT OF SPECTROSCOPIC ELEMENTS FOR THE ORBITS OF SOME SPECTROSCOPIC BINARIES IN THE OPEN CLUSTER TRUMPLER 16

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The Carina Nebula (NGC 3372) and the associated clusters in the region, provide clues to many problems of astrophysical interest since star formation seems to have taken place recently in that part of our Galaxy. Levato et al (ApJSS 75, 869, 1991) have determined the short period spectroscopic binary frequency among the brightest members of Trumpler 16 and they have detected five stars as possible spectroscopic binaries. The authors computed preliminary orbital elements for three of them. In order to improve these results we have reobserved the five stars again. They are: Tr16 #10, Tr 16 #104, Tr 16 #110, Tr 16 #112 and HD 93161. The purpose was to obtain more accurate orbital elements. The spectroscopic observations were performed with a REOSC èchelle spectrograph and a TEK 1024 X 1024 CCD, attached to "Jorge Sahade" 2.1 meter telescope at Complejo Astronómico El Leoncito, San Juan, Argentina. The resolving power of the new material is around 13000 and the S/N ratio of the new spectra is around 100. In total, twenty two new èchelle spectra were obtained for the program stars. This means we have added 50 % more observations to the spectroscopic material used by Levato et al (1991). As a result of this study, we have redetermined the orbital elements of three stars belonging to Trumpler 16: Tr 16 #104, Tr 16 #112 and HD 93161, but, for Tr 16 #10 and Tr 16 #110 we have not found any radial velocity variability with the present material.

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INTEGRATED SPECTRAL PROPERTIES OF 13 OPEN GALACTIC CLUSTERS

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We present flux-calibrated integrated spectra in the range 3800-6800 Å for 13 concentrated open clusters with Galactic longitudes between 219^o and 316^o, nine of which have not been previously studied. Using the equivalent widths of the Balmer lines and comparing the cluster spectra with template spectra of Magellanic Clouds and Galactic star clusters with known parameters, we derive both foreground interstellar reddening values and age. For nine clusters these two parameters have been determined for the first time, while for the rest of the sample the results show good agreement with previous studies. The present analysis indicates four very young (Hogg 11, NGC 5606, vdB-RN 80 and Pismis 17), seven moderately young (ESO 429-SC13, Hogg 3, Hogg 12, Haffner 7, BH 87, NGC 2368 and Bochum 12) and two intermediate-age (Berkeley 75 and NGC 2635) open clusters. The derived foreground interstellar reddening values are in the range $0.00 \leq$ E(B-V) ≤ 0.38. The age and reddening distributions of the present sample of relatively faint open clusters match those of open clusters with known parameters in a 90^o sector centered at $l = 270^o$. A detailed discussion is given in Ahumada et al. (A&A 377, 845).

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MEMBERSHIP, BINARITY AND STELLAR EVOLUTION OF RED GIANTS IN THE OPEN CLUSTERS NGC 2324, NGC 2818, NGC 3960 AND NGC 6259

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We present accurate radial velocities and photoelectric UBV photometry for 73 and 57 red-giant candidates, respectively, in the intermediate-age open clusters NGC 2324, 2818, 3960 and 6259. These data confirm the membership of 47 stars, 12 of which (26%) are spectroscopic binaries; three preliminary orbits have been determined in NGC 3960. From Washington photometry of 8 red giant members, the metallicity of NGC 6259 is found to be [Fe/H] = 0.06 ± 0.08. At the age of these clusters, most of the red giants are observed in the helium–core (clump) burning phase, the general morphology of which is well reproduced by theoretical models with convective overshooting. However, a number of bona fide cluster giant members are found significantly to the red of the isochrones, fitting the rest of the CMD of these and a few other clusters. Some of these stars are binaries, but others seem to be single. In either case, their red colours and/or low luminosities remain unexplained by current stellar evolution theory. A detailed discussion is given in A&A 375, 30.

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CCD WASHINGTON PHOTOMETRY OF THE OLDEST INTERMEDIATE-AGE CLUSTERS NGC 2121, NGC 2155 AND SL 896 (LW 480) IN THE LARGE MAGELLANIC CLOUD

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Washington system photometry of the intermediate-age LMC star clusters NGC 2121, NGC 2155 and SL 896 (LW 480) is presented. Ages and metallicities are derived from their T_1 vs C-T_1 colour-magnitude diagrams (CMDs). For the first time an age has been obtained for SL 896, 2.3 $\pm$ 0.5 Gyr. For NGC 2121 and NGC 2155 we derive 2.8 $\pm$ 0.5 Gyr and 3.6 $\pm$ 0.7 Gyr, respectively. The three clusters basically define the lower limit of the LMC age gap. In particular, NGC 2155 is confirmed as the oldest intermediate-age LMC cluster so far studied. The derived metallicities are [Fe/H] = -0.7 $\pm$ 0.2, -0.9 $\pm$ 0.2 and -0.6 $\pm$ 0.2 for NGC 2121, NGC 2155 and SL 896, respectively. The CMDs of the surrounding fields have a dominant turnoff comparable to that of the clusters themselves and similar metallicity, showing that one is dealing with an intermediate-age disk where clusters and field stars have the same origin. The LMC and SMC age-metallicity relations appear to be remarkably complementary; the SMC being actively star-forming during the LMC quiescent age gap epoch, as judged from the largest sample of Magellanic Clouds clusters with ages and metallicities determined on a homogeneous scale.

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PHOTOMETRIC SURVEY OF SOUTHERN OPEN CLUSTERS: MELOTTE 105, HOGG 15, PISMIS 21 AND RUPRECHT 140

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We present CCD BVI observations obtained for stars in the fields of two poorly studied (Melotte 105 and Hogg 15) and two almost unstudied (Pismis 21 and Ruprecht 140) open clusters. Neither Pismis 21 nor Ruprecth 140 appear to be genuine open clusters since no clear main sequences or other meaningful features can be seen in their colour-magnitude diagrams. Melotte 105 and Hogg 15 are open clusters affected by E(B-V) = 0.42 $\pm$ 0.03 and 0.95 $\pm$ 0.05, respectively. They are located at (2.2 $\pm$ 0.3) kpc and (2.6 $\pm$ 0.8) kpc from the Sun, while their corresponding ages estimated from empirical isochrones fitted to the Main Sequence cluster members are $\approx$ 350 Myr and 300 Myr, respectively. The present data are not consistent with the membership of the WN6 star HDE 311884 to Hogg 15. A detailed discussion is given in A&A 370, 931.

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EXPLORING STAR CLUSTER PROPERTIES AT THE SMC METALLICITY LEVEL

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In this study we present flux-calibrated integrated spectra in the range (3600-6800)Å for 15 concentrated star clusters in the Small Magellanic Cloud (SMC), approximately half of which constitute unstudied objects. We have mainly estimated ages and foreground E(B-V) values from the comparison of the line strengths and continuum distribution of the cluster spectra with those of template cluster spectra with known parameters. Most of the sample clusters are young blue clusters (6-60 Myr), while L 28, NGC 643 and L 114 are found to be intermediate-age clusters (1-6 Gyr). The sample includes clusters in the surroundings and main body of the SMC, and the derived foreground reddening values are in the range 0.00 $\leq$ E(B-V) $\leq$0.15. The present data also constitute a spectral library at the metallicity level of SMC clusters. A detailed discussion is under preparation.

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INTERACTIONS BETWEEN CLUSTERS IN THE MAGELLANIC CLOUDS AND IN THE MILKY WAY[1]

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In this work we performed N-body simulations of star cluster encounters with the TREECODE/TREESPH code in a CRAY T-94 computer, in order to study the dynamics of a large number of star cluster encounters. We tested important initial parameters in these models such as: cluster spatial separation, orbit eccentricity, number of particles and mass spectrum. We also studied cluster encounters subjected to an external field in order to test the influence of the galaxy tidal field in the star cluster dynamical evolution. From these simulations, we could compare the morphology and dynamical aspects of the models with the morphology of isolated and binary clusters from de Magellanic Clouds and our Galaxy. These images were obtained from *Digitized Sky Survey.* The simulations show that different results can occur depending on the initial parameters: (1) encounters without an external field can result in a merger with a different structure as compared to the original ones. When seen in a favourable plane, our resulting models show elliptical shapes comparable with some isolated LMC clusters. These encounters can represent a possible mechanism to explain the ellipticity observed in several star clusters in the Magellanic Clouds; (2) cluster encounters subject to an external field can result in a merge of the clusters or the disruption of the pair due to the galactic field. These results depend on the cluster pair distance from the galactic center and the type of orbital encounters. Isophotal maps of galactic star cluster pair, when compared to our models show evidence of interaction. This last result suggests that galactic open star cluster pair are a much more common phenomenon than the literature generally says.

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SPECTROSCOPIC BINARIES AND KINEMATIC MEMBERSHIP IN THE OPEN CLUSTER NGC 3532

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We report echelle spectroscopic observation for bright stars in the open cluster NGC 3532, including blue straggler candidates, red giants and main sequence stars up to 1 mag below the turnoff point. We compute radial velocities by cross-correlations, and determine spectral-types and rotational velocities. Using 20 stars identified as certain members, we derive a mean cluster velocity of $+2.6 \pm 0.3$ km s^{-1}. From radial velocities and angular distances to the cluster center we compute membership probabilities for all but three stars that are radial velocity variables. Only one out of 34 program stars is a clear kinematic non-member. Four spectroscopic binaries and two additional possible radial velocity variables are detected among the 23 stars measured more than once. We report the star HD 96609 as a double-lined spectroscopic binary. Using the two-dimensional cross-correlation technique TODCOR (Zucker & Mazeh 1994, ApJ 420, 806), we derive the radial velocity curves for both components, and obtain the orbital parameters with errors of 0.3% and 0.7% for the projected orbital semiaxis and masses, respectively. This system is composed by two main-sequence stars in a circular orbit, with a period of 8.19 days.

PHOTOMETRIC STUDY IN STOCK 16

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We present results from CCD UBVRI (Cousins system) photometric observations down to V = 18 in the region of the open cluster Stock 16. These data were obtained at the University of Toronto Southern Observatory (UTSO).

The cluster photometric diagrams reveal this object has a poorly populated upper main sequence. The extinction law in the cluster direction its normal, though the large color spread among the faintest stars could be produced by variable absoption in the cluster area. We obtained a mean color excess of

E_{B-V} = 0.51 for the cluster. Adopting a normal R value of 3.1 and the Schmidt-Kaler's (Landolt-Bornstein IV-2b, 1982) ZAMS we computed the cluster distance, finding that this object is located at 2300 ± 200 pc. Fitting the Schaller et al. (A&ASS 96, 269, 1992) isochrones set to our data, we found a nuclear age of $4 - 6$ My. However, the presence of several cluster stars above the ZAMS was noticed, which is compatible with a scenario of newly forming stars. That agrees with Herbst (AJ 80, 212, 1975) stellar formation idea on this region. Our computation of the cluster Initial Mass Function yields a distribution slope $x = 1.09 \pm 0.13$, that at 2σ level coincides with the Salpeter's (ApJ 121, 161, 1955) one. The star LSS 3017 (WR-WN4) is well located in the Stock 16 area. However its reddening is so high [probably because of small dust clouds] that it is probably not a member of the cluster. Something similar occurs with star LSS 3013 (WR-WC6+abs)(Turner, ApJ 292, 148, 1985). Some bright stars adopted as cluster members, show color over-excess relative of the rest of the cluster stars.

RECONOCIMIENTO UBVRI DE CÚMULOS ABIERTOS DEL HEMISFERIO NORTE

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Los cúmulos estelares son objetos ideales para la investigación de diversos problemas astrofísicos por ser grupos de estrellas formadas bajo las mismas condiciones, situadas a una misma distancia, con un amplio rango de masas y de formación aproximadamente simultánea. En su conjunto, los cúmulos constituyen sondas excelentes para el estudio de la estructura y evolución de la Galaxia. Individualmente, los cúmulos estelares imponen restricciones observacionales a las teorías de formación y evolución estelar. En lo que respecta a los estudios Galácticos, una de las más severas limitaciones observacionales es la ausencia de datos fotométricos para cerca de la mitad de los aproximadamente 1100 cúmulos conocidos, asociada a la falta de homogeneidad en los métodos de observación y de análisis utilizados en los cúmulos estudiados. Esta situación, que está en el origen de controversias tales como

(1) la existencia o no de un gradiente de metalicidad en función del radio Galactocéntrico

(2) la dependencia de la metalicidad con la altura relativa al disco Galáctico y,

(3) la incertidumbre en la caracterización de la estructura Galáctica (alabeo, corrugaciones, brazos espirales, etc.),

constituye la motivación del trabajo que se presenta. El objetivo principal de este proyecto es obtener un conjunto de datos CCD, en el sistema UBVRI, de una forma sistemática para una muestra de cerca de 500 cúmulos abiertos. Con esta fotometría de cúmulos en un sistema homogéneo en cuanto a la instrumentación (telescópio, detector, filtros) y a la reducción de datos (métodos y calibraciones) se pretende obtener:

- Un sistema de referencia para los estudios fotométricos de cúmulos
- Un atlas de diagramas color-color y color-magnitud
- Una escala homogénea de enrojecimientos, distancias y edades de cúmulos
- Critérios para la selección para estudios posteriores de estos cúmulos.

En esta contribución presentamos los primeros resultados del proyecto.

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A DRAO AND VLA STUDY OF THE ENVIRONMENT OF WR 130

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Wolf-Rayet stars and their massive O star progenitors, are responsible for most of the spectacular phenomena occurring in the interstellar medium (ISM) in galaxies. These stars emit most of their light in the ultraviolet, and have extremely powerful winds which deposit large amounts of momentum and mechanical energy into the ISM. The strong wind sweeps up the ambient gas forming an interstellar bubble (IB). In this paper we present the results of the study of an IB associated with the Wolf-Rayet star WR 130.

WR130 is classified as a WN8(h) star (van der Hucht, New Astronomy Reviews 45, 135, 2001). The distance to this star is somewhat uncertain, between 2.6 kpc (Conti & Vacca, AJ 100, 431, 1990) and 4.9 kpc (Hidayat, Supelli & van der Hucht, IAU Symp. 99, p. 27, 1982). An upper limit to its mass loss rate is 2.3×10^{-5} $M_\odot$ yr^{-1} (Abbott et al., ApJ 303, 239, 1986), and its terminal wind velocity is about 1000 kms^{-1} (Hamann et al., A&A 299, 151, 1995). Using narrow band Hα emission line imagery, a faint and diffuse 12-arcmin diameter nebula probably related to WR130 was found by Heckathorn et al. (ApJ 252, 230, 1982). This nebulosity is almost coincident with the H II region S98 (Sharpless, ApJ 54, 257, 1959). The environment of the Wolf-Rayet star WR130 has been studied using the 21 cm HI, line and radio continuum data at 408 and 1420 MHz obtained with the DRAO Synthesis Telescope. In addition, the H110α recombination line and 21 cm HI, line were observed using the Very Large Array in the DnC and D configurations. The Sharpless H II region, S98 (size $\sim 15'$), and two OB stars are observed near the Wolf-Rayet star position. An extended ring-shape structure of size $\sim 20'$ is observed in the radio continuum and infrared data. Of four compact radio sources seen superposed on the ring, one is an H II region of size $\sim 3'$ (G68.14+0.92), while the others are probably extragalactic. The spectral index ($S_\nu \propto \nu^\alpha$) of the ring is $\alpha = 0.0 \pm 0.1$. The thermal nature of the ring is confirmed by an analysis of the correlation between the brightness temperature at 21 cm and the brightness at 60 μm as observed with IRAS. The DRAO HI data show an HI bubble in the velocity range -12 to 1 kms^{-1}. The most striking characteristic of the HI cavity is the excellent correlation with the radio continuum ring. The WR star is not at the center of the ring but in the dense border to the East. This eccentric position can be explained by a combination of a high spatial velocity for the star and projection effects. The possible contribution of the OB stars present in the area is also considered. From our H110α observations, together with other recombination lines observed in the area; we deduce a distance of 12 kpc for the compact HII region (G68.14+0.92) and 5 kpc for the ring. We conclude that the ring is the radio counterpart of the optical HII region Sharpless 98 while G68.14+0.92 is a chance superposition of a much more distant source. The ionized mass of the ring is estimated at $\sim$3000 M$_\odot$, and the rms electron density at ~ 3 cm^{-3}, assuming a homogeneous distribution. A missing HI mass of 500 M$_\odot$ is obtained for the cavity and an excess HI mass of 1500 M$_\odot$ for the shell.

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THE MOLECULAR GAS ASSOCIATED WITH ARA OB1

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We present carbon monoxide observations carried out towards NGC6193 and its outskirts. This cluster is the heart of the OB association Ara OB1 which is dominated by two early O stars (HD 150135 and HD 150136) whose ionizing radiation generates the optical emission nebula RCW108 (Herbst & Havlen, A&ASS 30, 279, 1977). The widespread ionized gas and dust seen in optical plates disclose large amount of material still extant from the molecular cloud from which the association may have formed. To the west (about $15'$) of the O star pair, there is a bright rim marking the interface between the HII region and a dense molecular cloud. Using data obtained by the 1.2m CTIO telescope (HPBW $\sim 8.'7$) (Cohen, Surveys of the Southern Galaxy, p265, 1983) and the 4m Nagoya telescope (HPBW $\sim 2.'7$) (Fukui et al., Magellanic Clouds, p105, 1991), the distribution of the gaseous molecular matter is studied. Several CO lines at different radial velocities are observed in the area. Firstly, the kinematics and spatial distribution of the molecular gas were studied using the low angular resolution data. Molecular gas associated with Ara OB1 is found in the velocity range -27 to -18 km/seg. A strong spatial correlation between the dust emission at 60 and 100 μm and the CO concentrations is also found. Molecular gas breaks up into six concentrations. Five of them have a peak velocity from -25 to -23 kms^{-1} while the other is seen around -20 kms^{-1}. The full width at half maximum of the CO varies among the different concentrations, reaching a maximum of 9 kms^{-1} for the CO-feature related to the infrared cluster RCW108-IR (Straw et al., ApJ 314, 283, 1987). The total amount of molecular mass is likely to be related to Ara OB1 about $1.1 \times 10^4 M_\odot$. The CO gas shows a spatial distribution that almost mimics the distribution of the high optical obscuration regions. Data taken with the 4 m Nagoya telescope clearly show that molecular gas is absent in front of and beyond the optical HII region RCW108. This may indicate that we are observing a photodissociation region seen almost edge on. Based on the 4m single dish data small scale structure (clumps) are found in the most conspicuous CO-features.

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ENVIRONS OF BILATERAL SUPERNOVA REMNANTS WITH NEUTRON STARS

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Several galactic supernova remnants (SNRs) exhibit an unusual bilateral morphology, characterized by a clear axis of symmetry, low level of emission along this axis, and two bright limbs on either side. The origin of such appearance has provoked considerable debate along the years. A detailed study of the environs of bilateral SNRs is a very useful tool to disentangle intrinsic origins (precessing jets from a central neutron star, asymmetric explosion, etc.) from extrinsic ones (stratification of the interstellar density, the structure of the ambient magnetic field, etc.). We present the results of a survey of the neutral hydrogen around two southern bipolar SNRs containing neutron stars: G296.5+10.0 and G320.4-1.2. The observations were carried out using the Australia Telescope Compact Array (ATCA). We found that in the case of G296.5+10.0, the surrounding medium has had little influence in the morphology of the SNR. Besides, these observations allow us to confirm the physical association between the remnant and the isolated radio-quiet neutron star 1E 1207.4-5209. In the case of G320.4-1.2 we can confirm that the properties of the surrounding medium together with the characteristics of the associated pulsar, have determined the shape.

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TWO NEW PULSAR WIND NEBULAE AROUND SOUTHERN PULSARS

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Pulsars transfer the bulk of their rotational angular momentum in a wind of relativistic particles and Poynting flux. Under certain conditions, the interaction between this wind and its surroundings is observable in the form of a pulsar wind nebula (PWN). The radiation is of synchrotron origin and inverse Compton emission from relativistic particles and fields injected by the embedded pulsar. It is very important to determine the properties of the PWN in order to understand the pulsar wind characteristics, the conditions in the surrounding medium, and the coupling between them. We have carried out multi-frequency polarimetric VLA observations towards PSR B1643-43 and PSR B1706-44, looking for the radio synchrotron nebulae excited by the relativistic pulsar wind. For PSR B1643-43 we found evidences of a 4 arcmin comet-shaped nebula, suggestive of a synchrotron wake left by a fast moving pulsar. On the other hand, PSR B1706-44 appears to be surrounded by a spherical radio structure about 3 arcmin in diameter. Based on their morphology, the detection of linear polarization greater than 20%, and their flat radio spectra, we argue that they are wind nebulae powered by the rotational energy loss of the respective pulsars.

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CIRCUMSTELLAR RING FORMATION AT THE PROTOSTELLAR COLLAPSE

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We apply a model based in kinetic theory of rotating self-gravitating gases that foresees the formation of a circumstellar ring as result of the gravitational collapse and a strong transference of angular momentum to the boundaries of the system. The calculated rings are typically located within few AU from the central source, at distances where extra-solar planets have recently been found. We study the implication of the ring to the evolution of the stellar embryo and to the possible location of a subsequent planetary formation.

ORIENTACIÓN ESPACIAL DE NEBULOSAS PLANETARIAS ELONGADAS EN LA VIíA LÁCTEA

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Son pocos los trabajos llevados a cabo sobre la orientación de las NP en la Vía Láctea además sus resultados son poco claros y a veces contradictorios. Estas falencias dieron origen a este trabajo, el cual se realizó en dos regiones iguales, bien delimitadas y opuestas de cielo de 60^{o}x80^{o}. Los objetos que se consideraron poseen un diámetro superior a 10" y forma elongada manifiesta con el fin de conservar la pureza de la muestra. El ángulo de posición ecuatorial se midió en la forma usual del norte por el este (de 0^{o} a 180^{o}) en imágenes extraídas del relevamiento del ESO en la banda R y luego convertido a ángulo de posición galáctico. El error estimado en la determinación de los ángulos de posición galácticos fue de 8^{o}. Estos datos parecen indicar que existen algunas direcciones de mayor frecuencia en alargamiento: de hecho la distribución de sus ángulos de posición es bimodal, con uno de sus modos cercano al plano galáctico y el otro casi perpendicular al primero. Esta bimodalidad es un rasgo que difiere de lo que puede esperarse para una distribución aleatoria en el espacio de objetos de forma alargada.

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INTERSTELLAR MATTER IN GLOBULAR CLUSTERS

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In this work we continue our investigation on the problem of the existence of interstellar matter within globular clusters. We modelled the physics both of the interstellar material and of the interaction between its components, with the cluster and with the Galaxy. We used these models to generate numerical simulations of the evolution of this material inside the cluster. From these simulations we obtained the temporal evolution of the spatial distribution of this material, from which we derived limits for its detectability in a typical cluster. These models improve our former ones (Pellizza González, Forte & Carpintero, Bol. AAA 43, 49, 1999) in several ways. We included a more precise description of the interaction between gas and dust, and of the stellar mass-loss. We also included new models for the gas flow inside the cluster based on Parker's equation solutions, and we considered the effects of the discreteness of the sources of gravitational and radiation fields.

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DUST GRAIN INFLUENCE IN AN ALFVÉN WAVE DRIVEN LATE-TYPE WINDS

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Several mechanisms have been proposed for driving the cool, massive winds from late-type giant and supergiant stars. One of the acceleration mechanisms more promising involves the driving of mass loss by an outward-directed flux of Alfvén waves in a stellar atmosphere. The damping mechanisms for the waves, in a pure plasma wind, studied in the literature are the non-linear damping, resonant surface and turbulent (Jatenco-Pereira and Opher 1989). On the other hand, observational data from this star reveals the presence of grains, which can increase the dissipation of the Alfvén waves and modifies the velocity profile of the wind. In this work we study the influence of grains introducing them in the dispersion relation of the waves. We investigated the effect of grains in the wave driven mass loss model of Jatenco-Pereira and Opher (A&A 209, 327, 1989) and compared the results with the previous pure plasma wind. We show that in the presence of grains the waves are more efficiently damped, which causes a decrease of the plasma velocity and may increase its temperature. As the physical conditions for grain formation exist in other astrophysical sites, this damping by grains could be applied for example in jets, accretion disks and dense and cold clouds.

MAPPING OUT THE INTERSTELLAR EXTINCTION IN THE CENTRAL 10 DEGREES OF THE GALAXY WITH 2MASS

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We provide an A_K extinction map within 10° of the Galactic Centre using J and K_s magnitudes from the 2MASS Point Source Catalog for approximately 6×10^6 stars. The extinction was determined by fitting the upper giant branch of the (K_s, J-K_s) colour-magnitude diagram field to a dereddened upper giant branch mean locus built from Bulge fields of Frogel et al. (1999). The A_K extinction values vary from A_K=0.05 up to A_K=3.2 close to the Galactic Centre. For the region in the extinction map within $3° < |b| < 5°$ where the contribution of the dust behind Bulge stars is ≈ 5 % , we compare the extinction derived from the 2MASS data with that obtained from the dust emission by Schlegel et al. (1998). The two extinction determinations show a good correlation, the $A_{K,FIR}$ is higher than $A_{K,2MASS}$ indicating the need of better calibration of the relation dust column density $\times$ extinction to extinction values higher than $A_V > 0.5$ and correction by temperature effects in Schlegel et al.'s (1998) extinction data. The comparison of the present extinction map with that derived by Schultheis et al. (1999) using DENIS data indicates that they agree very well up to A_K=1.0. Above this limit, where internal errors in both extinction determination methods increase, the $A_{K,DENIS}$ values are higher probably due to DENIS photometry is more affected by completeness effects.

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A MEASUREMENT OF THE ATMOSPHERIC SECONDARY CHARGED COSMIC RADIATION AT A PLACE OF 11.5 GV GEOMAGNETIC CUT-OFF

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An experiment performed with a balloon-borne plastic scintillator is described. The detector system was transported by a stratospheric balloon, that was launched from Reconquista, province of Santa Fe, Argentina, on 24 February 1992. The geomagnetic cut-off of the site is 11.5 GV. The energy-loss spectra of both the atmospheric gamma radiation (for $E_\gamma \geq 4.15$ MeV) and the charged component of the secondary cosmic radiation were alernatively measured at different altitudes, during the ascent of the balloon, and at ceiling altitude. The atmospheric gamma-ray spectrum was analyzed in a previous paper (Azcárate, Rev. MexAA 36, 81, 2000). The shape of the energy-loss spectrum due to charged radiation can be explained, at least qualitatively, by the computation of the response of the detector to this type of radiation. It is argued that at ceiling altitude the observed feature in the spectrum is due mainly to relativistic muons falling horizontally upon the detector. The growth curve for the counting rate below the peak and the intensity of relativistic μ-mesons were also obtained.

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SPHERICAL EJECTION OF MATERIAL FROM A YOUNG STAR

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We report three epochs of VLBA water vapour maser observations toward the star forming region Cepheus A. The VLBA data show (ApJ, 560, 853, 2001) that some of the masers detected previously with the VLA unfold into unexpected and remarkable linear/arcuate continuous "microstructures". Both the morphology and the observed proper motions found in these water maser structures have allowed us to identify at least three different centers of star formation activity, unknown previously, in a region of 300 mas (200 AU) projected radius and that could constitute a triple star system. The flattened appearance of the small "building-blocks" constituting these water maser structures argues strongly for a shock nature. One of the water maser microstructures defines an expanding circle of $\simeq 62$ AU radius at the precision of one part in a thousand. We have interpreted this structure as due to a spherical ejection of material 33 years earlier from a protostar (Nat. 411, 277, 2001). The physical processes involved to produce such highly spherically symmetric

ejection are not known, introducing new constraints for theories on how stars evolve in their early stages.

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THE INTERACTION OF BD+24° 3866 AND BD+24° 3881 WITH THE SURROUNDING ISM

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We analyzed the interstellar medium in the vicinity of the massive stars BD+24° 3866 (O8.5II[f]) and BD+24° 3881 (O6.5IIIf) belonging to the Vul OB1 association based on infrared and radio data. HI-21cm line emission and 1420 and 408 MHz radio continuum observations were obtained with the Synthesis Telescope of the Dominion Radio Astrophysical Observatory (Canada) with synthesized beams of about 1.′5 and 7′ at 1420 and 408 MHz. High angular resolution *IRAS* data (*HIRES*) are also analyzed. BD+24° 3866 has been found to be located close to the inner border of a slowly expanding shell. The evolved HII region *S88* appears to be interacting with neutral material in the approaching part of this shell. We interpreted this HI structure as the neutral gas signature of the interaction of the stellar wind of the massive star with its surroundings. The neutral feature is about 24×15 pc in diameter and has a swept-up mass of about 1000 $M_\odot$. The present observational data do not allow us to identify a clear interstellar feature associated with BD+24° 3881. We propose different explanations for this fact.

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OUTFLOWS ASSOCIATED WITH THE PROTOSTARS IN THE ρ OPHIUCHI EMBEDDED CLUSTER

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We present results of an H_2 imaging survey of the ρ Ophiuchi proto-cluster to search for near-IR HH/jets associated with the forming stars in the cloud. The observations were carried with SOFI (Son of ISAAC) at the ESO NTT. We covered an area of roughly 30′ × 30′ on the cloud. This region was observed in both the H_2 (2.12 μm) and the H_{cont} (2.09 μm), the continuum nearby, filters. HH/jets clearly show up in the H_2 images (the line emission) and disappear in the adjacent continuum. We have detected $\sim$ 20 new near-IR HH/jets of different morphologies in the region emanating from the Class 0-I young stars in the cloud. However an unique and definitive identification of the driving source of each flow is not possible as several extremely young stars lie within a few arc-minutes of the positions of the structures found in H_2.

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NEUTRAL HYDROGEN AND RADIO CONTINUUM EMISSION IN THE IRAS VELA SHELL

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By using both the 21-cm HI line survey (Arnal et al., A&ASS 142, 35, 2000) and the 1435 MHz continuum survey (Testori, Thesis, 2000) from the southern hemisphere made at IAR, we have detected the HI and radio continuum emission counterpart of the IRAS Vela Shell.

It is a ring-like structure of dark clouds and Cometary Globules centered at $\ell \simeq 263^o$, b $\simeq -7^o$ and has a radius of $\sim 7^o$. It was discovered by Sahu (Thesis, 1992) from the Infrared Sky Survey Atlas maps. From our HI data we derived the velocity field in the shell and estimated its HI mass and its kinetic energy. We analyze the possible origin of the shell as the combined effect of the stellar winds from the massive stars and supernova explosion in the OB Association Vela OB2

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OPTICAL SPECTROSCOPY OF TWO ISO SELECTED CHAMAELEON I YOUNG STARS

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We present optical spectra of ISO-ChaI 126 and ISO-ChaI 237, two ISOCAM detected candidate young stellar objects in the Chamaeleon I dark cloud (Persi et al. 2000, A&A 357, 219). Both stars were also selected by Cambrésy et al. (1998, A&A 338, 977) based on IJK_s data. Our spectra were obtained at the CASLEO (San Juan, Argentina) using the REOSC spectrograph in the SD mode. The spectrum of ISO-ChaI 126 shows a veiled continuum as well as many emission lines. In particular, Hα, Hβ and [O I] 6300 Å are very remarkable. Hα has an equivalent width of 98 Å. This spectrum confirms the pre-main sequence nature of this object and allows us to classify this star as a CTTS (classical T Tauri star). For ISO-ChaI 237, Hα is clearly visible with an equivalent width of 1.5 Å. However, no Li I 6707 Å is undoubtedly present in our poor S/N data. Additional observations are required to certainly classify this object. Based on the current Hα detection and the measured equivalent width we tentatively classify this star as a WTTS (weak emission T Tauri star).

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NEAR-IR SPECTRA OF ISO DETECTED CHAMAELEON I YOUNG STELLAR OBJECTS

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We present 0.95 – 2.5 μm moderate (R $\sim$ 500) resolution spectra of 19 ISOCAM detected sources in the Chamaeleon I dark cloud. Thirteen of these sources are candidate very low mass members of the cloud proposed by Persi et al. (2000, A&A 357, 219) based on their mid-IR color excesses. Three show no mid-IR excesses and the other three (Sz 33, Cha Hα 1, and Cha Hα 2) are previously known members of the cloud. The spectra of previously known and ISO detected mid-IR excess sources are relatively flat and featureless in this wavelength range. Both atomic and molecular lines (when in absorption) are veiled suggesting the presence of continuum emission form circumstellar dust. In addition some of the sources show emission lines. The overall shape of the spectra in this wavelength range as well as the presence of veiled absorption and emission lines indicate that these sources are potential Class II young stellar members of the Chamaeleon I dark cloud. We apply the 2 μm water vapor index defined by Wilking et al. (1999, AJ 117, 469) to estimate spectral type for these sources. Most of the stars have spectral types M2-8. Finally we use Persi et al.'s luminosity determinations, in combination with D'Antona & Mazzitelli latest pre-main sequence evolutionary tracks, to estimate masses and ages for these stars. These sources have masses between 0.4 M$\odot$ and 0.08 M$\odot$ and ages of about 3×10^6 yrs, in good agreement with the higher mass members of this cloud.

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A NEAR-INFRARED IMAGING SURVEY OF THE GLOBULE 2 IN THE COALSACK

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We present results of a near-infrared imaging survey of the Globule 2 in the Coalsack. This Bok globule corresponds to the highest density region of this southern hemisphere molecular cloud and thus to the most likely region where young stars might be forming in this complex. The survey is complete for $K < 14.0$, $H < 14.5$, and $J < 15.5$, several magnitudes more sensitive than previous observations of this globule. We use the large number of background stars detected to derive an accurate near-infrared extinction law for the cloud. We applied the $J-H/H-K$ color-color diagram to search for candidate young stellar objects. We detect only three potential young stars in the Globule 2 with $K < 14.0$. This result indicates a low activity for the Coalsack as a stellar nursery. On the other hand, the detection of three potential young stars suggests a star-formation efficiency ($\sim$ 15%) for the Globule 2 similar to other well known star-forming regions, such as Taurus and Chamaeleon I.

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DISTRIBUTION AND KINEMATICS OF HI IN THE GALACTIC QUADRANT III

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We make use of our new high-sensitivity southern HI survey (cf. Arnal et al., A&ASS 142, 35, 2000), combined with the northern Atlas (Hartmann & Burton, Atlas of Galactic Neutral Hydrogen, Cambridge Univ. Press, 1997) to make a large-scale study of the HI-distribution and kinematics (cf. Bajaja et al., ASP Conf. Ser. Vol 218, 401, 2000). In this paper we focus mainly on the Galactic quadrant III (GQ III). The grid considered is $283° \geq l \geq 191°$, $+32° \geq | b | \geq -33°$ with spacings $(\Delta l, \Delta b) = (0.5° \cos b, 0.5°)$. The interval of radial LSR-velocities V is $+400 \geq V(\mathrm{km\ s^{-1}}) \geq -400$, and the spatial and velocity resolutions are 30' and 1.3 km $\mathrm{s^{-1}}$, respectively.

As is well-known, the GQ III contains a region of very low absorption, extending probably to nearly 1 kpc at $l \sim 210° - 255°$, as well as several HI-features, described by Lindblad (Bull. Ast. Inst. Netherlands 19, 34, 1967). Presumably, they correspond to spiral arms or spurs. Further remarkable large-scale features are Lindblad's ring, the region of the Gum nebula, and the supershell GSH 238+00+09 (cf. Heiles, ApJ 498, 689, 1998). One of the aims of this paper is to find out if there is any interaction between two or more of these objects. The study of the GQ III is also adequate for trying to check some of the conclusions of Olano's (AJ 121, 295, 2001) theory of the formation of the local system of gas and stars. Lindblad's ring and the local arm or spur are considered by us with this aim. We present a set of maps ($l - V, b - V$ and $l - b$, respectively). For distances $d > 1$ kpc, kinematical estimations are made using data for the outer rotation curve of the Milky Way derived from Binney & Dehnen (MNRAS 287, L5, 1997).

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STRUCTURE AND KINEMATICS OF THE HI IN THE SURROUNDINGS OF THE SCO-CEN ASSOCIATION

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We are using our new high-sensitivity southern HI survey (cf. Arnal et al., A&ASS 142, 35, 2000), combined with the northern Atlas (Hartmann & Burton, Atlas of Galactic Neutral Hydrogen, Cambridge Univ. Press, 1997) to make a large-scale study of the HI surrounding the Sco-Cen association (cf. Bajaja et al., ASP Conf. Ser. Vol 218, 401, 2000). The grid considered is $l = 230°$ to $40°$ through the Galactic center, and $230°$, $+60° \geq | b | \geq -60°$ with spacings $(\Delta l, \Delta b) = (0.5° \cos b, 0.5°)$. The interval of radial LSR-velocities V is $+400 \geq V(\mathrm{km\ s^{-1}}) \geq -400$, and the spatial and velocity resolutions are 30' and 1.3 km $\mathrm{s^{-1}}$, respectively.

We focus on the loops and shells described by de Geus (A&A 262, 258, 1992) schematically. A set of maps ($l - V, b - V$ and $l - b$, respectively) is presented. The maps reveal a considerable structure of the loops and shells in great detail. Estimations of the distances involved are intended with the help of optical interstellar absorption lines. Data at high resolutions (0.3-5.0 km $\mathrm{s^{-1}}$) are considered from the literature for more than 300 different stars. Furthermore, comparisons of the maps are made with observations at other wavelengths. Since the Sco-Cen association is considered to belong to the Gould Belt, we test the scenario of the formation of the Gould Belt by an explosive event (cf. Blaauw, Kon. Ned. Akad. Wet. 74, N^o 4, 1965, Lindblad et al., A&A 24, 309, 1973, Olano, A&A 112, 195, 1982). With this aim, we make use of some results computed by Pöppel & Marronetti (A&A 358, 299, 2000) for ejected test particles in order to compare with the kinematics of the local gas at intermediate and high latitudes. A self-consistent scenario to explain the morphology of planetary nebulae is presented. This scenario is consistent with the Galactic distribution of different nebular types. This work addresses several controversial features that appear in planetary nebulae, which are easily solved by the inclusion of MHD effects. These features include the presence of axisymmetric and collimated outflows with linearly increasing kinematics, and the existence of asymmetrical morphologies such as point-symmetric nebulae.

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THE MICROQUASAR LS 5039 AND THE SNR G016.8-01.1

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We have studied the possible association of the microquasar LS 5039 (Paredes et al., Sci. 288, 2340, 2000) with the supernova remnant G016.8-01.1.

From several optical databases and our own VLA and VLBA observations, we have estimated the proper motion of the microquasar LS 5039 (Paredes et al., Sci. 288, 2340, 2000), which results to be $\mu_{\alpha \cos\delta} = 4.7 \pm 1.1$ mas yr^{-1} and $\mu_\delta = -10.6 \pm 1.0$ mas yr^{-1}. On the other hand, from optical photometry we have estimated a distance of 2.9 ± 0.3 kpc to LS 5039. This estimate of the distance, together with the radial velocity of the system (McSwain et al., ApJ 558, L43, 2001), allows us to transform the proper motion into the space velocity in the LSR: $U = 40 \pm 5$, $V = -82 \pm 16$, $W = -118 \pm 19$ km s^{-1}. Hence, the source is escaping from its own regional standard of rest with a high velocity, probably obtained during the SN event. From the proper motion, it seems reasonable an association between LS 5039 and the SNR 0016.8– 01.1. H166α line observations of the foreground HII-region RCW 164, performed with the 30-m radiotelescope at IAR, show that the SNR G016.8-01.1 is farther than 1.8 kpc. However, the ambient density determined from the remnant's size, if located at 2.9 kpc, should be much larger than that estimated from our own IAR HI observations. This suggests that the distance to the SNR is greater than 2.9 kpc and hence it is not related to LS 5039.

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MEASURING THE LARGE-SCALE STRUCTURE OF THE UNIVERSE WITH THE UPDATED ZWICKY CATALOGUE

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We compute the galaxy redshift space power spectrum of Updated Zwicky Catalogue using Feldman, Kaiser & Peacock formalism for volume and magnitude limited samples constructed from this catalogue. The power spectrum obtained can be well aproximated by a power law $P(k) \propto k^n$ with an index $n = -1.7$ for wavenumbers $k \gtrsim 0.02h\mathrm{Mpc}^{-1}$, showing a flattening for smaller k. We have compared our determination with the recently obtained by Padmanabhan et al. using a completely different technique, finding a very good agreement between both samples. With the one obtained for other galaxy samples as the Stromlo-APM and the Durham/UKST Galaxy redshift surveys. We correct the redshift space power spectrum by redshift distortions to obtain the real space $P(k)$ using the one-dimensional velocity dispersion and the β parameter obtained by Padilla et al. Using this real space power spectrum, we derive a linear power spectrum for the UZC computing the inversion of the analytical formalism developed by Peacock & Dodds. We show that this lineal power spectrum can be very well approximated by a CDM model with fitting parameters $\Gamma = 0.2$ and $\sigma_8 = 0.95$.

THE CLUSTER OF GALAXIES ABELL 970

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We present a dynamical analysis of the galaxy cluster Abell 970 based on a new set of radial velocities measured at ESO, Pic du Midi and Haute-Provence observatories (Sodré et al., A&A 377, 128, 2001). Our analysis indicates that this cluster has a substructure and is out of dynamical equilibrium. This conclusion is also supported by differences in the positions of the peaks of the surface density distribution and X-ray emission, as well as by the evidence of a large-scale velocity gradient in the cluster. We

also found a discrepancy between the masses inferred with the virial theorem and those inferred with the X-ray emission, which is expected if the galaxies and the gas inside the cluster are not in hydrostatic equilibrium. Abell 970 has a modest cooling flow, as is expected if it is out of equilibrium. We propose that cooling flows may have an intermittent behaviour, with phases of massive cooling flows being followed by phases without significant cooling flows after the accretion of a galaxy group massive enough to disrupt the dynamical equilibrium in the centre of the clusters. A massive cooling flow will be established again, after a new equilibrium is achieved (work supported by FAPESP, CNPq and Pronex.)

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SURFACE PHOTOMETRY OF ULTRALUMINOUS IRAS GALAXIES

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Ultraluminous IRAS galaxies (ULIRGs), characterized by their high luminosities in the far-infrared, $L_{fir} > 10^{12} L_{\odot}$, are the most luminous starburst galaxies in the Local Universe (z $<$ 0.5). Most of the ULIRGs show strong signs of interaction and/or merger. Numerical simulations of collisions between galaxies which take into account gas and stars predict, as a result, morphologies during the process of collision, that are very similar to those that are actually observed. These results corroborate the interpretation that these systems are strongly interacting galaxies in the process of merging. Another hypothesis is that the ULIRGs may represent an early stage in the formation of elliptical galaxies.

We present, in this work, an analysis of the surface photometry in the B, V and R bands of a sample of 13 ultraluminous IRAS galaxies observed with the prime focus at the Isaac Newton 2.5m telescope at Roque de Los Muchachos, Canary Island, Spain. Our morphological classification for each galaxy consists in dividing them into three groups allowing an identification of the evolutionary phase of the collision/merger. Using the luminosity profiles in the R band (as a function of R, $R^{1/4}$ and log R), we determined which best represents the light distribution of each galaxy. Thus, relating the profiles with the morphology, we verified that most galaxies classified as being in a final stage of interaction, according to our classification criterium, are better described by a $R^{1/4}$ or a power law. Such galaxies may not have a disk structure, that probably would have been be destroyed during the collision process. Therefore, the relation between the light profile type and the morphological class of the ULIRGs indicates that the hypothesis that elliptical galaxies may be a product of mergers, and that probably ULIRGs represent some phase in the formation of these systems, is compatible with observations.

THE EFFECTS OF MERGERS ON THE ASTROPHYSICAL PROPERTIES OF GALAXY-LIKE OBJECTS

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The understanding of the processes by which high redshift systems assembled and became transformed into the galaxy population we observe today is still an open question. Recent sophisticated observations of galactic systems at different redshift have provided clues on the internal and dynamical properties of galaxies with different morphologies (e.g., Vogt et al., ApJ 465, L15, 1996; Courteau et al., ApJ 457, L73, 1996). These observations have shown the importance of mergers and interactions on the mass distributions. We study the formation of galaxies in hierarchical clustering models by using SPH cosmological simulations. The simulations are consistent with a standard CDM Universe. They include a star formation algorithm based on the Schmidt law. We analized the star formation history and merger trees of the objects in order to study and assess the effects of merger events on their properties. Our findings suggest that mergers and interactions trigger starbursts due to the action of tidal forces and collisions. These starbursts can feed the bulge of spiral-type objects. Once bulges are formed, they help to stabilize the disk systems which can survive subsequent mergers (Tissera et al., MNRAS 2001, submitted). Our results indicate that secular evolution and collisions work together in hierarchical scenarios regulating the star formation in galaxy-like objects and producing systems with structural parameters similar to those observed in spiral galaxies (Scannapieco et al., in preparation).

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THE DETERMINATION OF THE MASS POWER SPECTRUM FROM THE MASS FUNCTION OF GALAXY CLUSTERS

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We develop a new method that allows the determination of the mass power spectrum using the mass function of galaxy clusters based in the Press & Schechter and Sheth, Mo & Tormen formalisms. First, we derive the rms fluctuation of mass $\sigma(M)$ using the expression for the mass function obtained in those theories as differential equations. Then we use the Singular Value Decomposition technique to recover $\Delta^2(k)$ from $\sigma(M)$. The application of this method to the τCDM Hubble Volume simulations shows high efficiency recovering the correct shape of the power spectrum in a wide range of scales. The principal advantage of the method is that directly determines the mass power spectrum, without making any hypothesis about the bias beetwen the observed object distribution and the underlying mass distribution.

NUCLEAR AND CIRCUMNUCLEAR KINEMATICS OF SERSIC-PASTORIZA GALAXIES: NGC 5248

L. Vega[1], R.J. Díaz[1,2], S. Lípari[1,3], T. Storchi-Bergmann[4], and H. Dottori[4]

We report the results of spectroscopic observations of NGC 5248 made at Bosque Alegre, Casleo and CTIO. Extensive spectroscopic observations were made in order to cover the nuclear region. We study the kinematics and present a detailed Hα velocity field for the central region; the derived rotation curve of the Hα baricenter is also presented. Although the main part of the nuclear (ionized) gas rotates in a circular motion, we found radial velocity residuals (not reported previously) spatially associated with hot spots of the circumnuclear ring, indicating non circular motions of the ionized gas. We also obtain the radial velocities of the nuclear spiral (Laine et al, 1999; MNRAS 302, L33) and determined a trailing motion. The derived mass for the central regions is 3.1E9 $M_\odot$ within 10" (750 pc). The map of the Hα line FWHM is also presented.

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PHYSICAL CONDITIONS OF THE IONIZED GAS IN THE CENTRAL REGIONS OF SERSIC-PASTORIZA GALAXIES: NGC 5248

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We present the results of the optical spectrophotometric mapping together with photoionization models of the nuclear and circumnuclear region of the spiral galaxy NGC 5248. The electronic density obtained from the doublet of [SII] reaches its maximum at the central zone of the galaxy, as well as the ratios [NII]/Hα and [SII]/Hα. Detailed photoionization models indicate that the hot-spots and nucleus are photoionized H II regions with different values of chemical composition, ionization parameter and Teff of the ionizing stars. However, [NII]/Hα and [SII]/Hα are correlated with the FWHM of [NII] and [SII] respectively, being the correlations strongest at the inner parts of the ring, indicating that there is another excitation mecanism besides the pure stellar photoionization, probably shock waves.

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MAPEOS DE VIENTOS GALÁCTICOS EN IR MERGERS Y QSOS

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En esta contribución se presenta: (I) un resumen de los principales resultados obtenidos en el estudio de vientos galácticos en los siguientes IR mergers/QSOs: Mrk 231, Antena, Super-Antena, y NGC 3256; (II) un estudio de galaxias/QSOs con flujos salientes (out-flows) de alta velocidad, los cuales muestran energía nuclear de naturaleza compuesta, starburst+AGN (Lípari et al., MNRAS, 2001, enviado); (III) los primeros resultados de un mapeo con espectroscopía 2D de este tipo de objetos obtenido con el telescopio de 4.2m William Herchell. Se muestran mapas de líneas de emisión, de cinemática y de cocientes de flujos de líneas, los cuales muestran estructuras asociadas con el proceso de flujo saliente (conos, arcos, burbujas, etc). Se discuten modelos de vientos galácticos que permiten interpretar las observaciones; y se analiza la importancia de estos procesos en la formación y evolución de galaxias y AGNs.

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HIGH ORDER BIAS IN ELLIPSOIDAL COLLAPSE MODEL

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We present the advances in the study of the high order *bias* for the ellipsoidal collapse model. In the first part, we review the results obtained for the spherical collapse model, and compare the analytical results with numerical simulations; also we present the expression of the mass function in the ellipsoidal collapse model obtained by Sheth, Mo & Tormen (2001). Following Sheth, Mo & Tormen (2001), and Sheth & Tormen (submitted), we develop an analytical expression for the high order *bias* in the ellipsoidal collapse model.

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THE ENVIRONMENT OF ACTIVE OBJECTS IN THE NEARBY UNIVERSE

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We study the galaxy environment of active galaxies, radio-loud and radio-quiet quasars in the redshift range $0.1 \leq z \leq 0.2$. We use APM galaxies in order to explore the local galaxy overdensity and the $b_J - R$ colour distribution of neighboring galaxies of these target samples. For comparison, we perform similar analyses on samples of Abell clusters with X-ray emission, and samples of Abell clusters with richness $R = 1$ and $R = 0$. The projected cross-correlations show that the samples of quasars and active galaxies reside in regions with smaller galaxy density enhancements than $R = 0$ clusters. We find that the local galaxy overdensity of radio-loud and radio-quiet quasars are comparable. The analysis of the distribution of $b_J - R$ galaxy colour indexes shows that the environment of radio-loud quasars is not dominated by a population of red galaxies, characteristic of rich or moderately rich density enhancements such as Abell clusters with $R = 1$ or $R = 0$. The galaxies in environments of radio-quiet quasars are more similar to those in clusters while AGN show an intermediate behavior.

FIVE-YEAR OPTICAL VARIABILITY OF BRIGHT EXTRAGALACTIC SOURCES

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In this work we present a five-year monitoring of the quasar 3C 273 and the BL Lacs PKS 2155-304 and PKS 2005-489 - two of the brightest BL Lacs known. The data were obtained with the Meridian Circle of the Abrahão de Moraes Observatory (a 0.19 m refractor instrument and a focal distance of 2.6 m, with a CCD working in drift scanning mode) and analyzed using differential photometry (Dominici et

al., A&ASS 136, 261, 1999, for details). Significant variability was detected in different time scales for the two BL Lacs. Additionally, the photometric stability of reference and control stars was verified. In 1998, PKS 2005-489 underwent an X-ray flare, with a flux increase by a factor 30 relative to the quiescent value (Pearlman et al., ApJ 523, L11, 1999). The data that we present cover some months before the occurrence of this flare. The light curve of this source shows a high level of activity, in several time scales and with very interesting structures. The most prominent is the existence of increases in the flux density, with similar time scales and a peak magnitude in four campaigns, independent of the behavior of the light curve before and after the event. PKS 2155-304 was observed between 1996 and 1999. No variability with statistical significance was detected in the 1997 campaign. As in the case of PKS 2005-489, the light curve shows activity in different time scales. In 1999 the fastest variability was detected, with a time scale of some days and a total amplitude reaching 1 magnitude. Similarly to other BL Lacs, PKS 2155-304 shows periods of high activity, with rapid variability, intercalated with low activity period, as in 1997, mentioned above.

MORPHOLOGICAL SEGREGATION IN INTERMEDIATE REDSHIFT CLUSTERS

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Domínguez et al., AJ 121, 1266, 2001 have shown a strong dependence of galaxy morphological segregation with projected mass density in the innner region of nearby clusters as confronted to the local galaxy density. We analyze for a sample of intermediate redshift clusters ($z \sim 0.5$) the relative fraction of morphological types as a function of the projected local galaxy density and cluster projected total mass density. Our results show a different dependence of morphological segregation between the local and the intermediate clusters redshift samples. Our results suggests that there are different mechanisms controlling galaxy morphological segregation depending on the environment and redshift. This analysis will be extended to the spectral properties of the galaxies in the clusters, which also is expected to be strongly affected by the cluster medium.

DISTRIBUCIÓN DE MASA EN GALAXIAS ESPIRALES

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Estudiamos curvas de rotación de galaxias espirales, recientemente publicadas y de mayor resolución y grado de muestreo que en previos trabajos. El ajuste de componentes del potencial galáctico correspondientes a los distintos subsistemas morfológicos de cada galaxia indica que solo 3 de las 10 galaxias de la muestra presentan una componente en forma de halo masivo, de aproximadamente 3/4 de la masa total. Otro resultado preliminar pero significativo es que las densidades de masa centrales serían en general un orden de magnitud mayor que lo que se puede inferir del análisis de las curvas de rotación clásicas obtenidas por Rubin y colaboradores, con un valor máximo de $5\times10^{11}\,\mathrm{M}_\odot\,\mathrm{kpc}^3$, en la región central ($r < 100\,\mathrm{pc}$) de NGC 6946. La distribución de momento angular de las galaxias de la muestra se ajusta a la conocida ley $J_\mathrm{T} \sim M_\mathrm{T}^\alpha$, en el presente caso se determinó que $\alpha = 2.0 \pm 0.2$.

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PHOTOMETRY OF COMPACT GROUPS OF GALAXIES: SHAKHBAZYAN 362 & 166

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CCD photometry of Shakhbazyan Compact Group of Galaxies is being carried on in order to investigate their physical properties and to contribute to existing databases and improve statistics of such groups. We report here preliminary results of the observations of the groups Shk 362 and Shk 166 made with the JKT 1-meter telescope of the European Northern Observatory. The analysis of our deep B and I images and the $B-I$ color index reveals a predominance of early type galaxies and a high overall reddening. These results are similar to those obtained for other Shakhbazian groups by other authors.

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UNA FUSIÓN DE GALAXIAS

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Presentamos observaciones fotométricas y espectroscópicas del objeto peculiar ESO 074-IG020, cuyos caracteres más destacables son dos núcleos diferenciados conectados por un puente, y dos colas. Estudiamos siete zonas y encontramos que ellas tienen caracteres espectrales típicos de regiones HII de baja excitación, temperaturas electrónicas y densidades en el rango de valores normales para tales regiones, y un enrojecimiento interno alto. El ancho equivalente de Hα en el espectro integrado sugiere formación estelar acentuada ("starburst") en todo el objeto, y es compatible con la fusión de dos galaxias discoidales. Hemos detectado una sobreabundancia comparativa de nitrógeno en relación con la del oxígeno en el núcleo SW, el cual presenta la población estelar más evolucionada. El puente entre ambos núcleos también fue detectado en emisión Hα. Los colores $B-V$ de los núcleos, corregidos por absorción interna, también indican que son regiones de formación estelar. Las dispersiones de velocidades radiales estelares en los núcleos sugieren que la galaxia progenitora más masiva habría sido la que corresponde a la componente SW, la que a su vez tiene la cola de marea más corta. La distribución de velocidad radial del gas ionizado sugiere la presencia de dos subsistemas cinemáticos, cada uno asociado con un núcleo diferente.

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EL PAR DE GALAXIAS INTERACTUANTES VV 780

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Se presentan resultados morfológicos, espectrofotométricos y dinámicos del par de galaxias VV 780. La galaxia de mayor tamaño (componente E) presenta un brazo de marea que habría sido creado en el presente pasaje de la galaxia más compacta y pequeña del par (componente O). La componente O tiene un núcleo tipo Seyfert 2; la otra galaxia también presenta actividad nuclear aunque aún no clasificada. La velocidad radial heliocéntrica del sistema (promedio de la de ambas componentes) es $\mathrm{V_R} = (4830 \pm 40)\,\mathrm{km\,s^{-1}}$, resultando su distancia ($H = 75\,\mathrm{km\,s^{-1}\,Mpc^{-1}}$) de 64 Mpc. Las masas de las galaxias, interiores a los últimos puntos con velocidades radiales medidas, son: $\mathrm{M_E} \sim 4 \times 10^{10}\,\mathrm{M_\odot}$ y $\mathrm{M_O} \sim 4 \times 10^{9}\,\mathrm{M_\odot}$. El primero de estos valores es consistente con la dispersión central de velocidades estelares encontrada para la componente E, $\sigma_{\mathrm{VR}} \sim 390\,\mathrm{km\,s^{-1}}$, la cual indica una masa del orden de $3 \times 10^{10}\,\mathrm{M_\odot}$. Para que las galaxias estén ligadas gravitatoriamente, la masa total del sistema debe ser $3 \times 10^{11}\,\mathrm{M_\odot}$, pero la suma de las masas visibles de las componentes es un orden de magnitud menor, lo que sugiere la presencia de halos oscuros masivos. Dado que la interacción es evidente en la morfología y en la espectroscopía y que la relación masa-luminosidad para el sistema resulta $M/L_{\mathrm{B}} \sim 54$, más alta que los valores típicos para galaxias espirales, esa sugerencia parece muy aceptable.

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OBSERVACIONES CCD DE GRUPOS COMPACTOS DE HICKSON

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Los Grupos de Hickson se encuentran entre los más densos sistemas de galaxias conocidos y se definen por el número de miembros (n$\sim$4), compacticidad y grado de aislamiento. Estamos realizando en el Telescopio de Bosque Alegre observaciones sistemáticas espectroscópicas y fotométricas de varios de estos grupos, y reportamos aquí los resultados obtenidos en el estudio de HCG 48, 63 y 87. Hemos mejorado la determinación de las velocidades radiales de todos los miembros aparentes de cada grupo y determinamos las amplitudes de velocidades radiales internas de la mayoría de las galaxias en cada sistema. Reportamos también la luminosidad y los índices de color de los objetos. Entre los resultados más importantes podemos destacar:

HCG 48. Las galaxias A y D constituyen un par físicamente relacionado, mientras que los miembros aparentes B y D se encontrarían respectivamente más lejos y más cerca que el mencionado par.

HCG 63. Las galaxias B, C y D se encuentran físicamente asociadas mientras que la galaxia A se encuentra más cerca y presenta un núcleo de apariencia triple. Las dos galaxias más brillantes del trío presentan morfología típica de interacciones. La galaxia D, menos brillante, tiene un índice de color

más azul y un mayor ancho equivalente de la línea de emisión Hα.

HCG 87. Las galaxias A, B y C conforman un trío, mientras que las D y E se encontrarían respectivamente más cerca y más lejos del mismo. La galaxia A, una espiral gigante con una masa de $\sim 1.2 \times 10^{12}\,\mathrm{M}_{\odot}$, es de morfología distorsionada. Los mapas de color de la galaxia B revelan la existencia de un anillo circunnuclear.

En los casos aquí analizados, la probabilidad de que un miembro aparente pertenezca al grupo es de sólo 65%, y para los objetos físicamente asociados a un grupo, es de un 100% la probabilidad de presentar líneas de emisión nucleares.

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ANILLOS ADENTRO: LAS REGIONES CENTRALES DE NGC 1433

R.J. Díaz[1,2], E. Agüero[1,3], E. Bajaja[3,4] y G. Carranza[1,3]

NGC 1433 es una galaxia barreada que exhibe tres estructuras anulares concéntricas: anillo exterior, anillo interior y anillo circumnuclear de formación estelar ($r \sim 350\,\mathrm{pc}$). Las propiedades globales de esta galaxia han sido estudiadas en forma extensa por tratarse de uno de los objetos más cercanos que exhiben esta peculiaridad. El presente trabajo aporta un estudio espectrofotométrico y cinemático detallado de las regiones centrales incluyendo el anillo circumnuclear y el núcleo galáctico. El anillo interior se halla cercano al círculo de co–rotación con la barra y el anillo circumnuclear es más interno que la Resonancia Interna de Lindblad. La masa total interior al mismo es del orden de $10^9\,\mathrm{M}_{\odot}$. Se detecta además un desplazamiento del núcleo, definido como el baricentro de la emisión en continuo, con respecto al centro de simetría de la curva de rotación. Las condiciones físicas del gas ionizado en el anillo son típicas de regiones de formación estelar, mientras que en el núcleo la emisión muestra una actividad tipo LINER.

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ESPECTROSCOPÍA, FOTOMETRÍA Y POLARIMETRÍA DEL BLAZAR PKS 2155-304

R. J. Díaz[1], R. L. Tommasi[2] y E. Pian[3]

Reportamos los resultados del estudio integral de PKS 2155-304, uno de los blazars australes más cercanos. Obtuvimos numerosos espectros de resolución baja y moderada, que muestran un continuo sin líneas de emisión y con una pendiente del tipo $F_{\nu} \sim \nu^{\alpha}$ ($\alpha \sim -0.8$). La presencia de líneas de absorción originadas en la galaxia huésped nos ha permitido confirmar y mejorar la determinación del corrimiento al rojo del objeto, $z = 0.1158 \pm 0.0002$, la distancia a PKS 2155-304 sería de sólo 460 Mpc (h=0.75). También monitoreamos simultáneamente el flujo total y polarizado de este objeto intensivamente en las bandas UBVRI durante varias campañas en el período 1998-2000. Las observaciones se realizaron con el fotopolarímetro de Turín en CASLEO y el EMF en la EABA. Aunque el flujo total no muestra variaciones que correlacionen con aquellas del flujo linealmente polarizado, el porcentaje de polarización varió significativamente al igual que el AP de polarización. Comentamos los resultados a la luz de los distintos modelos que explican este tipo de actividad.

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ACCELERATION OF ULTRA-HIGH-ENERGY COSMIC-RAYS IN ACCRETION-INDUCED COLLAPSE PULSARS IN THE LOCAL UNIVERSE

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The origin and nature of the observed cosmic ray events with energies beyond 10^{20}eV is a mystery. Up to now, more than 55 with $E > 4 \times 10^{19}$ eV have been detected and so far, the lack of knowledge of efficient acceleration mechanisms and the expected strong energy losses due to pair and photo-pion production at these energies have precluded any reliable statement about their nature and sources. We here discuss the possibility that these ultra-high energy cosmic rays (UHECRs) could be mostly protons accelerated in magnetic reconnection sites just above the

magnetosphere of newborn millisecond pulsars originated by accretion induced collapse (AIC-pulsars) (de Gouveia Dal Pino & Lazarian, ApJ 536, L31, 2000). We find that the observed total flux of UHECRs can be produced by the integrated contribution from all AIC-pulsars of the local distribution of galaxies within a distance which is unaffected by the GZK cutoff (< 50 Mpc). We also examine the potential acceleration mechanisms in the reconnection site and find that first–order Fermi acceleration cannot provide either sufficient efficiency (due to Synchrotron losses) or the expected spectral index for the UHECR particle spectrum. This leaves the one-shot acceleration via an induced electric field within the reconnection region as the only viable process for UHECR acceleration. We find that AIC-pulsars with surface magnetic fields $10^{12} - 10^{15}$ G, and spin periods $\sim 1-60$ ms, are able to accelerate particles to energies $> 10^{20}$ eV, but the magnetic field just above the Alfvén surface must be predominantly toroidal for the particles to be allowed to escape from the acceleration zone without being deflected (de Gouveia Dal Pino & Lazarian, ApJ 560, 358, 2001).

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CATALOGUE OF DOUBLE NUCLEI DISK GALAXIES

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We have compiled a catalogue of disk galaxies that have double nuclei, through systematic examination of existing catalogues and publications. The Catalogue of Double Nuclei Disk Galaxies includes 132 objects, together with their basic data. The aim of the catalogue is to provide a more systematic and homogeneous basis for the study of the relevance of interactions in the formation of these double nuclei. In order to achieve an homogeneous and physically representative sample, only galaxies that fulfilled the following selection requirements were included: - $VR < 15000\ \mathrm{km\,s^{-1}}$ (i.e. $z < 0.05$) - Disk Galaxies (galaxies with double nuclei can be found usually among cluster cDs -objects of this class were excluded) - Regular outer isophotes (i.e. no tails or strong tidal distortions). We have also investigated possible correlations between geometric and photometric parameters of the double nuclei and their host galaxies. The preliminary results indicate the presence of several significative correlations that should be considered in any theoretical scenario describing minor mergers and disk galaxies evolution.

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OBSERVATIONS OF DOUBLE NUCLEI DISK GALAXIES

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We present new results of photometric and spectroscopic observations of double nuclei disk galaxies, made at Bosque Alegre Astrophysical Station. The objects were selected from the Catalogue of Double Nuclei Disk Galaxies (Gimeno, Díaz & Carranza 2001, this volume). In particular, we derive the BVRI luminosities of each nucleus component, the Hα equivalent width and the radial velocity differences between them. The full set of data is available on request to the authors.

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STUDY OF THE TRANSPARENCY OF THE MAGELLANIC CLOUDS FROM INTEGRATED SPECTROSCOPY OF BACKGROUND GALAXIES

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We study the spectral properties in the range (3600-6800)Å of the nuclear region of galaxies behind the Magellanic Clouds. The radial velocities clarified the nature of the objects as background galaxies or extended objects belonging to the Clouds. For most galaxies behind the main bodies of the LMC and SMC, radial velocities were measured for the first time. In the present sample, typical LMC background galaxies are nearby [4000 < V(km/s) < 6000], while SMC's are considerably more distant [10000 < V(km/s) < 20000]. We determine the reddening in each line of sight by means of comparisons with reddening–free galaxy templates for different stellar populations. For the LMC main body, we derive a combined Milky Way and internal reddening value E(B-V)$_{MK+i}$ = 0.12 ±0.10, while for the SMC E(B-V)$_{MK+i}$ = 0.05 ± 0.05. By subtracting Milky Way reddening values for galaxies projected onto the surroundings of each Cloud, we estimate mean internal reddening values ΔE(B-V)$_i$ = 0.06 and 0.04, respectively, for the main bodies of the LMC and SMC. The Clouds are optically thin, at least in the directions of the studied background galaxies, which are often difficult to be identified as such on ESO/SERC sky survey images. Nevertheless, more reddened zones may occur where it is difficult to identify galaxies, especially towards the LMC main body. A detailed discussion is given in A&A 371, 895.

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ANALYSIS OF METALLICITY AND AGE VARIATIONS OF POPULOUS CLUSTERS WITH THE LINE-OF-SIGHT DEPTH IN THE SMALL MAGELLANIC CLOUD

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We present an analysis of age, metal abundance, and positional data on 12 well known populous clusters in the Small Magellanic Cloud (SMC), with the ultimate aim of determining the line-of-sight (LOS) depth of the SMC using these clusters as proxies. The observational data indicate that the eastern side of the SMC (facing the LMC) contains younger and more metal-rich clusters as compared with the western side. The trend is suggestive and warrants further study. There is a slight negative gradient in the distance of the clusters as a function of Declination, the southern half of the galaxy proving to be more distant as compared with the northern half. Depending on how the reddening is computed to our clusters, we find a mean distance modulus that ranges from (m-M)$_o$ = 18.71 ± 0.06 to 18.82 ± 0.05. The ±1σ LOS depth of the SMC populous clusters in our study is between ≈ 6 kpc and ≈ 12 kpc, depending primarily on the adopted reddening values. Viewing the SMC as a triaxial galaxy with the Declination, Right Ascension, and LOS depth as the three axes, we find axial ratios of approximately 1:2:4. These conclusions largely agree with those of previous investigators and serve to underscore the utility of populous star clusters as probes of the structure of the SMC. A detailed discussion is given in AJ 122, 220.

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MORPHOLOGY, KINEMATICS AND SPECTROSCOPY OF THE PAVUS TRIPLE SYSTEM

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NGC6769, NGC 6770 and NGC 6771 are the more spectacular compact group of spiral galaxies in the Pavus-Indus southern constellation, and they would be located in the central region of a major group of galaxies distant 50 Mpc (H_0 = 75 km s^{-}1 Mpc^{-}1). We have studied spectra of lower and medium resolution, obtained with the 1.54m reflector telescope of the Bosque Alegre Astrophysical Station using the Multifunction Spectrograph in the long-slit mode of EMF. The emission and absorption lines (NaI 5889Å, 5895Å, Hα 6563Å, [NII] 6548Å, 6584Å) were adjusted by gaussians to determine the parameters which describe them. The systemic velocity values obtained by us are (3865 ± 30) km/s for NGC 6769, (3805 ± 30) km/s for NGC 6770 and (4410 ± 30) km/s for NGC 6771. The determination of kinematic properties of ionized gas and stars in each component has allowed us to estimate the masses and the mass-luminosity ratio of each galaxy of the group. The three galaxies have a mass greater than $10^{11}M_\odot$ and the more massive will be NGC 6771 (~ 5 x $10^{11}M_\odot$). The three galaxies have morphological evidences of interaction, being the most perturbated NGC 6770, with a tidal arm that points its interaction with NGC 6769.

The spectrophotometric analysis of lower resolution shows that NGC 6770 is an active galaxy with nuclear emission ratios of LINER type.

TIME DELAY IN QSO 0957+561 FROM 1984-99 DATA

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Photometric data of QSO 0957+561 covering the period 1984–99 are analyzed to discern between the two values of the time delay (417, e.g. Colley & Schild ApJ 540, 104, 2000, and 424 days, e.g. Serra-Ricart et al., ApJ 526, 40, 1999) mostly accepted in the recent literature. The observations, performed by groups from three different institutions—Princeton University, Harvard-Smithsonian CfA, and Instituto de Astrofísica de Canarias—, were obtained in five filters (V, R, I, g, and r). The different light curves have been divided into observational seasons and two restrictions have been applied to better calculate the time delay: (i) the strange points have been removed; and (ii) clean data sets have been selected. To be sure about the goodness of the calculations, several techniques to obtain the time delay, $\Delta\tau_{AB}$, have been tested with simulated data, the methods giving the best results then being selected: the discrete correlation function δ-square, z-transformed discrete correlation function, and linear interpolation. A detailed analysis of the 23 different time delays derived from each technique shows that $\Delta\tau_{AB}$ must be into the interval 420–424 days, and none of these methods clearly favors the values 416–418 days as the right time delay. Finally, when all the results are treated in a statistical way, the value $\Delta\tau_{AB} = 422.5 \pm 0.8$ is obtained. On the other hand, when the time delays whose error bars exclude the interval 420–424 days are removed, the value $\Delta\tau_{AB} = 422.0 \pm 0.5$ is obtained.

CATÁLOGOS SINTÉTICOS DE GALAXIAS Y CÚMULOS DE GALAXIAS

E. Díaz[1], M. Merchan[2], H. Muriel[2] y D. García Lambas[2]

Presentamos catálogos sintéticos de galaxias y cúmulos de galaxias los cuales reproducen los diferentes efectos de selección de los catálogos reales. Los catálogos se extienden hasta corrimientos al rojo (redshift) de $z \approx 1$ y se han tenido en cuenta los diferentes procesos evolutivos. Dichos catálogos se construyeron a partir de resultados observacionales y de simulaciones numéricas cosmológicas; lo cual permitió una correcta asignación de magnitudes y tipos morfológicos para cada galaxia. Estos catálogos sintéticos serán utilizados para evaluar la validez de diferentes técnicas de detección de estructuras, como así también para el estudio del comportamiento de la distribución de materia en el universo a través de la comparación con catálogos reales.

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GRUPOS DE GALAXIAS EN EL ENTORNO DE CÚMULOS

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El catálogo SARS (Southern Abell Redshift Survey, Way y otros 2001, en preparación) provee de más de 4000 galaxias con estimas de corrimientos al rojo (redshift) en dirección a 40 cúmulos de galaxias de Abell. Solo una fracción de estas galaxias son miembros de cúmulos, el resto forman sistemas menores como por ejemplo grupos de galaxias. Ramella y otros (AJ 113, 483, 1997) desarrollaron una técnica que permite identificar grupos en forma homogénea en el espacio de los corrimientos al rojo. La aplicación de esta técnica al SARS permitió obtener el primer catálogo de grupos de galaxias en la vecindad de cúmulos el cual puede ser utilizado para realizar estudios de la estructura en gran escala, como por ejemplo caracterizar el flujo de materia hacia los cúmulos de galaxias.

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LAS GALAXIAS MÁS BRILLANTES DE CÚMULOS

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Las galaxias más brillantes de cúmulos (BCGs) presentan una pequeña dispersión en magnitud. Algunos autores sugieren que son simplemente el extremo brillante de la distribución de galaxias normales. No obstante, también se ha sugerido que

se trataría de una clase especial de galaxias. Esta última teoría en parte se apoya en la existencia de las galaxias cD que conforman un grupo dentro de las BCGs. Estas galaxias presentan peculiaridades en su morfología, siendo la más notable la existencia de un halo extendido de bajo brillo superficial. Independientemente de la naturaleza de las BCGs, se ha sugerido el uso de las mismas como indicador de distancia de los cúmulos (Sandage 1972) y han sido utilizadas para medir el flujo de Hubble a grandes distancias así como la velocidad del grupo local.

La técnica básica de estima de distancia vía las BCG es la descripta por Lauer & Postman (1994): se define la luminosidad métrica L_m medida para un radio fijo r_m la cual puede ser predicha mediante el parámetro $\alpha = d\log L_m/d\log r|_{r_m}$ (Hoessel, ApJ 241, 492, 1980). Es decir, la relación $L_m - \alpha$ sería una correlación entre magnitud y radio de las BCGs. La dependencia de las BCGs con el entorno (fundamentalmente estudiadas por las propiedades en X de los cúmulos) se relacionarían con diferencias en la acreción de estrellas de población vieja. Dado que la tasa de acreción de estrellas puede depender fuertemente de la dinámica de las galaxias en el cúmulos, es que el presente trabajo propone estudiar la dependencia entre la dinámica de las galaxias en cúmulos (dispersión de velocidad σ) con la luminosidad métrica y el parámetro α.

De la muestra de Lauer & Postman (ApJ 425, 418, 1994), se seleccionaron aquellos cúmulos para los cuales se dispone de determinaciones de la dispersión de velocidad de las galaxias. La muestra total consta de 47 cúmulos. En la figura 1 se puede ver que la muestra seleccionada cubre un importante rango de σ_s.

Para poder relacionar σ, M_L y α los tres parámetros entre si se propuso la existencia de una suerte de plano fundamental de la siguiente forma: $L \propto \sigma^a \alpha^b (1)$. El ajuste de este plano, testeado mediante la comparación entre la magnitud absoluta observada y la predicha por la ecuación 1, muestra una importante correlación, aunque con una dispersión significativa. Restringiendo la muestra para cúmulos con $\alpha \geq 0.64$, se obtiene una apreciable disminución de la dispersión. Para la sub-muestra $\alpha \geq 0.64$ obtenemos una diferencia media entre la magnitud absoluta predicha y la observada de 0.18, mientras que si asumimos que M_L no depende de α ni de σ se obtiene una dispersión media de 0.26.

MODELS FOR THE GALACTIC STRUCTURE AND EVIDENCE OF A BAR AT THE GALACTIC CENTER

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Based on observations of external galaxies, we have noticed that the main tracers of the spiral structure are: the HII regions, the interstellar dust and the gas, more notedly in its molecular form. We have elaborated two models to describe the structure of the Galaxy, that reproduce the longitude-velocity (l-v) diagram, through the adjustment of parameters of such spiral arms as initial radius, inclination angle, size and phase of the arm. In the first model, we have adjusted the parameters of the arms to reproduce the l-v diagram of the observed HII regions (catalog of Kuchar & Clark, ApJ 488, 224, 1997). In the second model, we have reproduced the l-v diagram ($b=0^o$) for the neutral hydrogen. The presence of arms with variable pitch angles and their structure as bridges, bifurcations, segments of arms which are observed in other galaxies appear naturally in the models and are necessary to describe the l-v diagrams observed. The tangential directions predicted by the models were compared with the longitudinal profiles ($b=0^o$) of the interstellar dust (IRAS 100 microns and COBE / DIRBE), carbon monoxide (Dame et al., ApJ 322, 706, 1987) and of HI. The analysis of the latitudinal profiles of the interstellar dust consists of an important tool for the identification of great structures, as observed in the inner Galaxy, in which an inclined structure is seen. In this case geometric arguments allow us to infer its edges, which correspond to the longitudes of -12^o and $+18^o$ and represent a strong evidence for the existence of the bar.

MASCO GAMMA-RAY EXPERIMENT LABORATORY IMAGES

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We present preflight laboratory images obtained with the MASCO coded mask balloon borne gamma-ray telescope. We also present an overall description of the technical characteristics of this experiment, which was designed to obtain images of cosmic sources with a 14-arcminute resolution over an 14-degree circular field of view and operates between 50 keV

and 1.8 MeV on board stratospheric balloons. The MASCO experiment employs a Modified Uniformly Redundant Array coded mask and a NaI(Tl) position sensitive detector. The attitude control system was designed to provide a few arcminute pointing accuracy. This instrument is scheduled to fly in 2002.

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NEW PARTIAL LOW-FREQUENCY RADIO SKY MAPS

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A radio continuum survey of the all sky is underway in the frequency range between 408 MHz and 10 GHz. Known as the Galactic Emission Mapping (GEM) project, it aims to accurately determine the spatial distribution and absolute intensity in the radio and microwave spectrum of the radiation emitted by the Milky Way galaxy and by the unresolved blend of external galaxies. The project employs a portable radiotelescope, which is currently operating in Cachoeira Paulista, SP, Brazil. We present the first results of the observations carried out in the Southern Hemisphere in the frequencies of 1.465 MHz and 2.3 GHz.

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THE ACE PROJECT: A PROGRAM TO MEASURE ANISOTROPIES AND POLARIZATION IN THE COSMIC MICROWAVE BACKGROUND RADIATION

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We present the ACE (Advanced Cosmic Explorer) project which is collaboration between the Instituto Nacional de Pesquisas Espaciais (INPE) and Escola Federal de Engenharia de Itajubá, Brazil, and the University of California Santa Barbara (UCSB), USA, that aims to conduct observations of anisotropies and polarization of the Cosmic Microwave Background Radiation both from balloon platforms and from the ground. Using our recently completed BEAST payload, we will undertake a series of flights using both standard and long duration balloons. The missions will study the millimeter wavelength sky from 1 mm to 10 mm with beam sizes ranging from 4 arc minutes to 25 arc minutes respectively. The core program is centered around our 2.2 meter diameter lightweight off-axis Gregorian telescope that is designed to fly in conventional (1 day), long duration (10 - 20 day) and ultra-long duration (100 day) modes with a variety of detectors as well as to make observations from the ground. This telescope is designed to achieve a beam size of 80' at 10 GHz, 40' at 20 GHz, 27' at 30 GHz, 20' at 40 GHz, 9' at 90 GHz and 4' at 200 GHz. This allows for precise studies of the CMBR anisotropies and related mm wave sources over a broad spectrum of wavelengths and angular scales.

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BIDIMENSIONAL DIGITIZATION OF PHOTOGRAPHIC STELLAR SPECTRA OF CÓRDOBA OBSERVATORY

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An important collection of photographic spectra obtained between years 1944 to 1984 exists at Córdoba Observatory. It is a valuable source of Southern Hemisfere spectroscopic stellar data. A digital spectroscopic archive is being constructed with them in order to permit the data access to the astronomical community. The spectral plates are being digitized with a scientific grade CCD bidimensional camera generating FITs format digital images of spectra. A front illuminated CH260 Photometrics camera, with a 1024 x 1025 pixels of 19 microns size Thompson TH7896 CCD chip, digital resolution 16 bit is used. Digital data consist of the Catalog of Plates: Object Name, Spectra Number, Acquisition Date, Type of Plate, Exposure Time, Calibration Data and Notes. In addition two images in FITs format displaying a

copy of the photographic stellar spectra with the corresponding Fe/Ne spectra are provided. These images are corrected by bias and flatfield, one with the red part and other with the blue part of the spectra. Data are provided in relative photographic density in counts vs. pixel number. For a primary evaluation of the spectra quality, the data of the corresponding two collapsed spectra and its comparison are provided. The photographic calibration curve, if available, is also provided. This archive can be accessed at www.oac.uncor.edu/data_archive/stellar_spectra.

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THE NEW SUBMILLIMETER-WAVE SOLAR TELESCOPE

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A new and unique solar submillimeter telescope (SST) was installed in El Leoncito site, Argentina Andes. It has a 1.5 m redome-enclosed cassegrain antenna, and arrays of four 212 GHz and two 405 GHz radiometers placed in the focal plane. We present a brief technical description of the system, preliminary results on its performance, the atmospheric opacity measured at the site, and the first detection of solar flare submm-w emissions.

One of the authors (PK) is also part time with CCS, Unicamp, Campinas, SP, Brazil. The present work was supported by FAPESP under grant No 99/06126-7. JPR acknowledges CNPq Grant 300782/96-9 as well as financial assistance from the IAU.

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THE EXTINCTION COEFFICIENT OF BOSQUE ALEGRE ASTROPHYSICAL STATION

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Using the images obtained in several observing runs to find light curves of asteroids, we determine the extinction coefficient of Bosque Alegre Astrophysical Station, for each night during the 3 years of observations. We use the field stars for each frame taken in the R filter and the results show a tendency to increase the mean coefficient of extinction in that filter.

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MEASUREMENT OF ASTROMETRIC PLATES WITH CCD

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The measurement of Carte du Ciel plates from Córdoba Zone using a CCD based measuring system (Bustos Fierro 1998) was assessed. For the automatic detection of stellar images, SExtractor (Bertin & Arnouts 1996) and software that exploits the geometry of triple exposures ad hoc constructed (Bustos Fierro et al. 2000) were used. From the analysis of rectangular coordinates of stellar images an internal error of 0.06 pixels, that is equivalent to 0.11 arcseconds was obtained. External comparison with results of a previous digitization of the same plate with MAMA from Paris Observatory (Bustos Fierro & Calderón 2000) gives a standard error of 0.22 arcseconds after the correction of systematic effects.

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ON THE EVOLUTION OF THE DIURNAL ATMOSPHERIC OPACITY AT EL LEONCITO

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MICA (Mirror Coronograph for Argentina) is a solar telescope installed at the "Estación de altura Carlos U. Cesco", El Leoncito, San Juan, Argentina (depending from the Observatorio Astronómico Félix Aguilar (OAFA), UNSJ) since August 1997. The instrument is part of a bilateral science program between Argentina and Germany. The institutions involved in the cooperation agreement are, on the german side, the Max-Planck-Institute für Aeronomie (MPAe) and the Max-Planck-Institut für Extraterrestrische Physik (MPE). On the argentinean side are the Instituto de Astronomía y Física del Espacio (IAFE, Buenos Aires) on behalf of CONICET, and the University of San Juan through the OAFA Observatory. The automatic detection of the sky conditions at the site are of crucial importance for the determination of the operation mode of the telescope, the so called "Sky Tester" and "Sun Tester" devices being the auxiliary instruments needed for such a task. The first one records the sky brightness around the solar disk and the latter measures the integrated solar disc intensity, both in white light. Such data allow the daily determination of the variability of the diurnal atmospheric opacity. Moreover, statistical studies about the sky quality evolution at the site are also possible. We present a first approach to the analysis of the evolution of the mean diurnal atmospheric opacities (corresponding to the morning and the afternoon) in the period January 1988 - December 2000. Such study is of fundamental importance for the planification of specific observing campaigns with the solar instruments available at the Cesco Station (a solar coronograph: MICA and an $H\alpha$ telescope: HASTA). The daily mean values obtained are also useful parameters for the characterization of the sky quality at the site on the corresponding observing day, while their dispersion accounts for the variability of the sky brightness along the day. We conclude from the analysis of the period mentioned above, that the most appropriate season for observing campaigns would be autumm, as the lowest opacity value (in average) as computed in this work is obtained. Furthermore, this epoch exhibits the greatest number of days with favorable conditions either during mornings or afternoons.

The database will be extended to year 2001 and future years in order to have an updated database. The sky variability will be analyzed in deeper detail to have a reliable estimator to account not only for the sky variability but also for the presence of clouds, features not considered in this work (as they were eliminated prior to the estimation of the opacity value).

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