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THE MASSIVE STAR NEWSLETTER

formerly known as the hot star newsletter

*

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Call for next Massive Star Meeting organization

Dear Colleagues,

After the fantastic meeting in Auckland (thanks to JJ Eldridge and the whole organizing team) we have to start preparing the next Massive Stars Meeting. We expect this to take place some time in 2020.

With this call the Organizing Committee (OC) of our Massive Stars Commission invites any interested individuals/institutions to send an email before September 1st, 2017 expressing an interest in organizing the next meeting. IAU has the final authority to select a symposium, but the Massive Star Commission OC will support one application based on a number of criteria. Once selected, the OC will assist the meeting organizer in the whole application to IAU process, including preparation and submission, SOC selection, etc. Our criteria for selection include:

- the meeting location (traditionally, our group prefers locations near a beach with a relaxed atmosphere that encourages personal contacts)
- the availability of hotels with large conference rooms (at least 200 people) and meeting facilities at affordable prices
- the support of a local astronomical community
- the balance of locations hosting all our previous meetings

If possible, your email to the OC should contain the following information:

- A list of local volunteers willing to help organizing the meeting
- A list of hotels that can guarantee accommodation of at least 200 participants, and with appropriate conference facilities
- Approximate hotel room prices
- Approximate distance from the nearest airport to the meeting venue/hotel
- Alternative sponsors or ways to support the meeting
- The best dates for the meeting, and/or black out dates
(because of school holidays or high touristic season, etc.)
- Add any other information you consider will be useful to OC.

The email should be sent directly to the President of the Commission, Artemio Herrero (ahd-at-iac.es).

The massive stars meeting is one of the central pillars of
our community and therefore the OC thanks in advance anyone interested in organizing this important meeting.

with best regards,
Artemio Herrero,
on behalf of the Organizing Committee of the G2 Commission

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PAPERS

Abstracts of 14 accepted papers

Kepler sheds new and unprecedented light on the variability of a blue supergiant: gravity waves in the O9.5Iab star HD 188209

Aerts, C.; Simon-Diaz, S.; Bloemen, S.; Debosscher, J.; Papics, P. I.; Bryson, S.; Still, M.; Moravveji, E.; Williamson, M. H.; Grundahl, F.; Fredslund Andersen, M.; Antoci, V.; Palle, P. L.; Christensen-Dalsgaard, J.; Rogers, T. M.

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Stellar evolution models are most uncertain for evolved massive stars. Asteroseismology based on high-precision uninterrupted space photometry has become a new way to test the outcome of stellar evolution theory and was recently applied to a multitude of stars, but not yet to massive evolved supergiants.Our aim is to detect, analyse and interpret the photospheric and wind variability of the O9.5Iab star HD 188209 from Kepler space photometry and long-term high-resolution spectroscopy. We used Kepler scattered-light photometry obtained by the nominal mission during 1460d to deduce the photometric variability of this O-type supergiant. In addition, we assembled and analysed high-resolution high signal-to-noise spectroscopy taken with four spectrographs during some 1800d to interpret the temporal spectroscopic variability of the star. The variability of this blue supergiant derived from the scattered-light space photometry is in full in agreement with the one found in the ground-based spectroscopy. We find significant low-frequency variability that is consistently detected in all spectral lines of HD 188209. The photospheric variability propagates into the wind, where it has similar frequencies but slightly higher

amplitudes. The morphology of the frequency spectra derived from the long-term photometry and spectroscopy points towards a spectrum of travelling waves with frequency values in the range expected for an evolved O-type star. Convectively-driven internal gravity waves excited in the stellar interior offer the most plausible explanation of the detected variability.

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Uncrowding R 136 from VLT/SPHERE extreme adaptive optics

Z. Khorrami , F. Vakili , T. Lanz, M. Langlois, E. Lagadec , M. R. Meyer , S. Robbe-Dubois , L. Abe , H. Avenhaus , JL. Beuzit, R. Gratton , D. Mouillet , A. Origné , C. Petit, J. Ramos

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This paper presents the sharpest near-IR images of the massive cluster R136 to date,
based on the extreme adaptive optics of the SPHERE focal instrument implemented on the ESO Very Large Telescope and operated in its IRDIS imaging mode.

The crowded stellar population in the core of the R136 starburst compact cluster remains still to be characterized in terms of individual luminosities, age, mass and multiplicity. SPHERE/VLT and its high contrast imaging possibilities open new windows to make progress on these questions.

Stacking-up a few hundreds of short exposures in J and Ks spectral bands over a Field of View (FoV) of 10.9" x 12.3" centered on the R136a1 stellar component, enabled us to carry a refined photometric analysis of the core of R136. We detected 1110 and 1059 sources in J and Ks images respectively with 818 common sources.

Thanks to better angular resolution and dynamic range, we found that more than 62.6% (16.5%) of the stars, detected both in J and Ks data, have neighbours closer than 0.2" (0.1").
%We found that more than 62.6% (16.5%) of the stars, detected both in J and Ks data, have visual companion closer than 0.2" (0.1").

The closest stars are resolved down to the full width at half maximum (FWHM) of the point spread function (PSF) measured by Starfinder.
Among newly resolved and detected sources R136a1 and R136c are found to have optical companions

and R136a3 is resolved as two stars (PSF fitting) separated by 59±2 mas. This new companion of R136a3 presents a correlation coefficient of 86% in J and 75% in Ks.
The new set of detected sources were used to re-assess the age and extinction of R136 based on 54 spectroscopically stars that have been recently studied with HST slit-spectroscopy (Crowther et al. 2016) of the core of this cluster.

Over 90% of these 54 sources identified visual companions (closer than 0.2").
We found the most probable age and extinction for these sources are $1.8^{+1.2}_{-0.8}$ Myr, $A_J=(0.45\pm0.5)$mag and $A_K=(0.2\pm0.5)$mag within the photometric and spectroscopic error-bars. Additionally, using PARSEC evolutionary isochrones and tracks, we estimated the stellar mass range for each detected source (common in J and K data) and plotted the generalized histogram of mass (MF with error-bars).

Using SPHERE data, we have gone one step further and partially resolved and studied the IMF covering mass range of (3 - 300) $M_{\odot}$ at the age of 1 and 1.5 Myr. The density in the core of R136 (0.1 - 1.4 pc) is estimated and extrapolated in 3D and larger radii (up to 6pc).
We show that the stars in the core are still unresolved due to crowding, and the results we obtained are upper limits. Higher angular resolution is mandatory to overcome these difficulties.

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Weblink: http://arxiv.org/abs/1703.02876

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The early B-type star Rho Oph A is an X-ray lighthouse.

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We present the results of a 140 ks XMM-Newton observation of the B2 star ρ Ophiuchi A. The star exhibited strong X-ray variability: a cusp-shaped increase of rate, similar to the one we partially observed in 2013, and a bright flare. These events are separated in time by about 104 ks, which likely correspond to the rotational period of the star (1.2 days). Time resolved spectroscopy of the X-ray spectra shows that the first event is almost only due to an increase of the plasma emission measure, while the second increase of rate is mainly due is a major flare, with temperatures in excess of 60 MK (kT~5 keV). From the analysis of its rise we infer a magnetic field of ≥300 G and a size of the flaring region of $\sim1.4-1.9\times10^{11}$ cm, which corresponds to ~25%−30% of the stellar radius. We speculate that either an intrinsic magnetism that produces a hot spot on its surface, or an unknown low mass companion are the source of such X-rays and variability. A hot spot of magnetic origin should be a stable structure over a time span of ≥2.5 years, and suggests an overall large scale dipolar magnetic field that produce an extended feature on the stellar surface. In the second scenario, a low mass unknown companion is the emitter of X-rays and it should orbit extremely close to the surface of the primary in a locked spin-orbit configuration, almost on the verge of collapsing onto the primary. As such, the X-ray activity of the secondary star would be enhanced by both its young age and the tight orbit like in RS Cvn systems and Rho Oph would constitute an extreme system worth of further investigation.

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First Detection of Mid-Infrared Variability from an Ultraluminous X-Ray Source Holmberg II X-1

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We present mid-infrared (IR) light curves of the Ultraluminous X-ray Source (ULX) Holmberg II X-1 from observations taken between 2014 January 13 and 2017 January 5 with the Spitzer Space Telescope at 3.6 and 4.5 μm in the Spitzer Infrared Intensive Transients Survey (SPIRITS). The mid-IR light curves, which reveal the first detection of mid-IR variability from a ULX, is determined to arise primarily from dust emission rather than from a jet or an accretion disk outflow. We derived the evolution of the dust temperature (Td~600−800 K), IR luminosity (LIR~3×10^4 L), mass (Md~1−3×10^{−6} M), and equilibrium temperature radius (Req~10−20 AU). A comparison of X-1 with a sample spectroscopically identified massive stars in the Large Magellanic Cloud on a mid-IR color-magnitude diagram suggests that the mass donor in X-1 is a supergiant (sg) B[e]-star. The sgB[e]-interpretation is consistent with the derived dust properties and the presence of the [Fe II] (λ=1.644 μm) emission line revealed from previous near-IR studies of X-1. We attribute the mid-IR variability of X-1 to increased heating of dust located in a circumbinary torus. It is unclear what physical processes are responsible for the increased dust heating; however, it does not appear to be associated with the X-ray flux from the ULX given the constant X-ray luminosities provided by serendipitous, near-contemporaneous X-ray observations around the first mid-IR variability event in 2014. Our results highlight the importance of mid-IR observations of luminous X-ray sources traditionally studied at X-ray and radio wavelengths.

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Does the Wolf-Rayet binary CQ Cep undergo sporadic mass transfer events?

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Stellar wind mass-loss in binary systems carries away angular momentum causing a monotonic increase in the orbital period, P-dot>0. Despite possessing a significant stellar wind, the eclipsing Wolf-Rayet binary system CQ Cep does not show the expected monotonic period increase, in fact, it is sometimes reported to display the opposite behavior. The objective of this paper is to perform a new analysis of the rate of period change P-dot and determine the conditions under which Roche Lobe overflow (RLO) mass-transfer combined with wind mass loss can explain the discrepant behavior. The historic records of times of light curve minima were reviewed and compared with the theoretical values of P-dot for cases in which both wind mass-loss and RLO occur simultaneously. The observational data indicate that P-dot alternates between positive and negative values on a timescale of years. The negative values (P-dot ~ -0.6 to -8.5 s/yr) are significantly larger in absolute value than the positive ones (P-dot ~+0.2 to +1.2 s/yr). We find that a plausible scenario for CQ Cep is one in which the O star undergoes intense but sporadic RLO events that lead to accretion onto the WR star, at which times P-dot<0. At other times, P-dot>0 when the WR wind, and possibly material swept up from the O star, carries angular momentum away from the system. A scenario in which the WR star is the mass donor cannot be excluded, but requires that either the WR wind mass-loss rate undergoes large sporadic enhancements or that an additional process that removes angular momentum from the system be present.

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On the Absence of Non-thermal X-Ray Emission around Runaway O Stars

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Theoretical models predict that the compressed interstellar medium around runaway O stars can produce high-energy non-thermal diffuse emission, in particular, non-thermal X-ray and γ-ray emission. So far, detection of non-thermal X-ray emission was claimed for only one runaway star, AE Aur. We present a search for non-thermal diffuse X-ray emission from bow shocks using archived XMM-Newton observations for a clean sample of six well-determined runaway O stars. We find that none of these

objects present diffuse X-ray emission associated with their bow shocks, similarly to previous X-ray studies toward ζ Oph and BD+43°3654. We carefully investigated multi-wavelength observations of AE Aur and could not confirm previous findings of non-thermal X-rays. We conclude that so far there is no clear evidence of non-thermal extended emission in bow shocks around runaway O stars.

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Wolf-Rayet spin at low metallicity and its implication for Black Hole formation channels

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The spin of Wolf-Rayet (WR) stars at low metallicity (Z) is most relevant for our understanding of gravitational wave sources such as GW 150914, as well as the incidence of long-duration gamma-ray bursts (GRBs). Two scenarios have been suggested for both phenomena: one of them involves rapid rotation and quasi-chemical homogeneous evolution (CHE), the other invokes classical evolution through mass loss in single and binary systems. WR spin rates might enable us to test these two scenarios. In order to obtain empirical constraints on black hole progenitor spin, we infer wind asymmetries in all 12 known WR stars in the Small Magellanic Cloud (SMC) at Z = 1/5 Zsun, as well as within a significantly enlarged sample of single and binary WR stars in the Large Magellanic Cloud (LMC at Z = 1/2 Zsun), tripling the sample of Vink (2007). This brings the total LMC sample to 39, making it appropriate for comparison to the Galactic sample. We measure WR wind asymmetries with VLT-FORS linear spectropolarimetry. We report the detection of new line effects in the LMC WN star BAT99-43 and the WC star BAT99-70, as well as the famous WR/LBV HD 5980 in the SMC, which might be evolving chemically homogeneously. With the previous reported line effects in the late-type WNL (Ofpe/WN9) objects BAT99-22 and BAT99-33, this brings the total LMC WR sample to 4, i.e. a frequency of ~10%. Perhaps surprisingly, the incidence of line effects amongst low-Z WR stars is not found to be any higher than amongst the Galactic WR sample, challenging the rotationally-induced CHE model. As WR mass loss is likely Z-dependent, our Magellanic Cloud line-effect WR stars may maintain their surface rotation and fulfill the basic conditions for producing long GRBs, both via the classical post-red supergiant (RSG) or luminous blue variable (LBV) channel, as well as resulting from CHE due to physics specific to very massive stars (VMS).

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Revealing the structure of the outer disks of Be stars

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The structure of the inner parts of Be star disks (~< 20 stellar radii) is well explained by the viscous decretion disk (VDD) model, which is able to reproduce the observable properties of most of the objects studied so far. The outer parts, on the other hand, are not observationally well-explored, as they are observable only at radio wavelengths. A steepening of the spectral slope somewhere between infrared and radio wavelengths was reported for several Be stars that were previously detected in the radio, but a convincing physical explanation for this trend has not yet been provided. We test the VDD model predictions for the extended parts of a sample of six Be disks that have been observed in the radio to address the question of whether the observed turndown in the spectral energy distribution (SED) can be explained in the framework of the VDD model, including recent theoretical development for truncated Be disks in binary systems. We combine new multi-wavelength radio observations from the Karl.~G.~Jansky Very Large Array (JVLA) and Atacama Pathfinder Experiment (APEX) with previously published radio data and archival SED measurements at ultraviolet, visual, and infrared wavelengths. The density structure of the disks, including their outer parts, is constrained by radiative transfer modeling of the observed spectrum using VDD model predictions. In the VDD model we include the presumed effects of possible tidal influence from faint binary companions. For 5 out of 6 studied stars, the observed SED shows strong signs of SED turndown between far-IR and radio wavelengths. A VDD model that extends to large distances closely reproduces the observed SEDs up to far IR wavelengths, but fails to reproduce the radio SED. Using a truncated VDD model improves the fit, leading to a successful explanation of the SED turndown observed for the stars in our sample. The slope of the observed SEDs in the radio is however not well reproduced by disks that are simply cut off at a certain distance. Rather, some matter seems to extend beyond the truncation radius, where it still contributes to the observed SEDs, making the spectral slope in the radio shallower. This finding is in agreement with our current understanding of binary truncation from hydrodynamical simulations, in which the disk does extend past the truncation radius. Therefore, the most probable cause for the SED turndown is the presence of binary companions that remain undetected for most of our sources.

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Chemical abundances of fast-rotating massive stars. I. Description of the methods and individual results

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Recent observations have challenged our understanding of rotational mixing in massive stars by revealing a population of fast-rotating objects with apparently normal surface nitrogen abundances. However, several questions have arisen because of a number of issues, which have rendered a reinvestigation necessary; these issues include the presence of numerous upper limits for the nitrogen abundance, unknown multiplicity status, and a mix of stars with different physical properties, such as their mass and evolutionary state, which are known to control the amount of rotational mixing. We have carefully selected a large sample of bright, fast-rotating early-type stars of our Galaxy (40 objects with spectral types between B0.5 and O4). Their high-quality, high-resolution optical spectra were then analysed with the stellar atmosphere modelling codes DETAIL/SURFACE or CMFGEN, depending on the temperature of the target. Several internal and external checks were performed to validate our methods; notably, we compared our results with literature data for some well-known objects, studied the effect of gravity darkening, or confronted the results provided by the two codes for stars amenable to both analyses. Furthermore, we studied the radial velocities of the stars to assess their binarity. This first part of our study presents our methods and provides the derived stellar parameters, He, CNO abundances, and the multiplicity status of every star of the sample. It is the first time that He and CNO abundances of such a large number of Galactic massive fast rotators are determined in a homogeneous way.

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Observational signatures of past mass-exchange episodes in massive binaries: The case of LSS 3074

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The role of mass and momentum exchanges in close massive binaries is very important in the subsequent evolution of the components. Such exchanges produce several observational signatures such as asynchronous rotation and altered chemical compositions, that remain after the stars detach again. We investigated these effects for the close O-star binary LSS 3074 (O4 f + O6-7:(f):), which is a good candidate for a past Roche lobe overflow (RLOF) episode because of its very short orbital period, P = 2.185 days, and the luminosity classes of both components. We determined a new orbital solution for the system. We studied the photometric light curves to determine the inclination of the orbit and Roche lobe filling factors of both stars. Using phase-resolved spectroscopy, we performed the disentangling of the optical spectra of the two stars. We then analysed the reconstructed primary and secondary spectra with the CMFGEN model atmosphere code to determine stellar parameters, such as the effective temperatures and surface gravities, and to constrain the chemical composition of the components. We confirm the apparent low stellar masses and radii reported in previous studies. We also find a strong overabundance in nitrogen and a strong carbon and oxygen depletion in both primary and secondary atmospheres, together with a strong enrichment in helium of the primary star. We propose several possible evolutionary pathways through a RLOF process to explain the current parameters of the system. We confirm that the system is apparently in overcontact configuration and has lost a significant portion of its mass to its surroundings. We suggest that some of the discrepancies between the spectroscopic and photometric properties of LSS 3074 could stem from the impact of a strong radiation pressure of the primary.

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Massive star formation by accretion II. Rotation: how to circumvent the angular momentum barrier?

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Rotation plays a key role in the star-formation process, from pre-stellar cores to pre-main-sequence (PMS) objects. Understanding the formation of massive stars requires taking into account the accretion of angular momentum during their PMS phase. We study the PMS evolution of objects destined to become massive stars by accretion, focusing on the links between the physical conditions of the environment and the rotational properties of young stars. In particular, we look at the physical conditions that allow the production of massive stars by accretion. We present PMS models computed with a new version of the Geneva Stellar Evolution code self-consistently including accretion and rotation according to various accretion scenarios for mass and angular momentum. We describe the internal distribution of angular momentum in PMS stars accreting at high rates and we show how the various physical conditions impact their internal structures, evolutionary tracks, and rotation velocities during the PMS and the early main sequence. We find that the smooth angular momentum accretion considered in previous studies leads to an angular momentum barrier and does not allow the formation of massive stars by accretion. A braking mechanism is needed in order to circumvent this angular momentum barrier. This mechanism has to be efficient enough to remove more than 2/3 of the angular momentum from the inner accretion disc. Due to the weak efficiency of angular momentum transport by shear instability and meridional circulation during the accretion phase, the internal rotation profiles of accreting stars reflect essentially the angular momentum accretion history. As a consequence, careful choice of the angular momentum accretion history allows circumvention of any limitation in mass and velocity, and production of stars of any mass and velocity compatible with structure equations.

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The Evolution and Physical Parameters of WN3/O3s: a New Type of Wolf-Rayet Star

Kathryn F. Neugent (1,2), Philip Massey (1,2), D. John Hillier (3), and Nidia I. Morrell (4)

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As part of a search for Wolf-Rayet (WR) stars in the Magellanic Clouds, we have discovered a new type of WR star in the Large Magellanic Cloud (LMC). These stars have both strong emission lines, as well as HeII and Balmer absorption lines and spectroscopically resemble a WN3 and O3V binary pair. However, they are visually too faint to be WN3+O3V binary systems. We have found nine of these WN3/O3s, making up ~ 6% of the population of LMC WRs. Using CMFGEN, we have successfully modeled their spectra as single stars and have compared the physical parameters with those of more typical LMC WNs. Their temperatures are around 100,000 K, a bit hotter than the majority of WN stars (by around 10,000 K) although a few hotter WNs are known. The abundances are what you would expect for CNO equilibrium. However, most anomalous are their mass-loss rates which are more like that of an O-type star than a WN star. While their evolutionary status is uncertain, their low mass-loss rates and wind velocities suggest that they are not products of homogeneous evolution. It is possible instead that these stars represent an intermediate stage between O stars and WNs. Since WN3/O3 stars are unknown in the Milky Way, we

suspect that their formation depends upon metallicity, and we are investigating this further by a deep survey in M33, which posses a metallicity gradient.

Reference: ApJ, in press
Status: Manuscript has been accepted

Weblink: https://arxiv.org/abs/1704.05497

Comments:

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The wind speeds, dust content, and mass-loss rates of evolved AGB and RSG stars at varying metallicity

Steven R. Goldman (1), Jacco Th. van Loon (1), Albert A. Zijlstra (2), James A. Green (3,4), Peter R. Wood (5), Ambra Nanni (6), Hiroshi Imai (7), Patricia A. Whitelock (8,9), Mikako Matsuura (10), Martin A. T. Groenewegen (11), and José F. Gómez (12)

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2 - Jodrell Bank Centre for Astrophysics, Alan Turing Building, School of Physics and Astronomy, The University of Manchester, Oxford Road, Manchester M13 9PL, UK
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5 - Research School of Astronomy and Astrophysics, Australian National University, Weston Creek, ACT 2611, Australia
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7 - Department of Physics and Astronomy, Kagoshima University, 1-21-35 Korimoto, Kagoshima 890-0065, Japan
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9 - Astronomy Department, University of Cape Town, 7701 Rondebosch, South Africa
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11 - Royal Observatory of Belgium, Ringlaan 3, B-1180 Brussels, Belgium
12 - Instituto de Astrof´ısica de Andaluc´ıa, CSIC, Glorieta de la Astronom´ıa s/n, E-18008 Granada, Spain

We present the results of our survey of 1612-MHz circumstellar OH maser emission from asymptotic giant branch (AGB) stars and red supergiants (RSGs) in the Large Magellanic Cloud (LMC). We have discovered four new circumstellar maser sources in the LMC, and increased the number of reliable wind speeds from infrared (IR) stars in the LMC from 5 to 13. Using our new wind speeds, as well as those from Galactic sources, we have derived an updated relation for dust-driven winds: vexp ∝ ZL0.4. We compare the subsolar metallicity LMC OH/IR stars with carefully selected samples of more metal-rich OH/IR stars, also at known distances, in the Galactic Centre and Galactic bulge. We derive pulsation periods for eight of the bulge stars for the first time by using near-IR photometry from the Vista Variables in the Via Lactea survey. We have modelled our LMC OH/IR stars and developed an empirical method of deriving gas-to-dust ratios and mass-loss rates by scaling the models to the results from maser profiles. We have done this also for samples in the Galactic Centre and bulge and derived a new mass-loss prescription which includes luminosity, pulsation period, and gas-to-dust ratio M˙ = 1.06+3.5 −0.8 ×

10−5(L/104 L) 0.9±0.1(P /500 d)0.75±0.3(rgd/200)−0.03±0.07 M yr−1. The tightest correlation is found between mass-loss rate and luminosity. We find that the gas-to-dust ratio has little effect on the mass-loss of oxygen-rich AGB stars and RSGs within the Galaxy and the LMC. This suggests that the mass-loss of oxygen-rich AGB stars and RSGs is (nearly) independent of metallicity between a half and twice solar.

Reference: MNRAS, 465, 403 (2017)
Status: Manuscript has been accepted

Weblink: http://adsabs.harvard.edu/abs/2017MNRAS.465..403G

Comments:

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Observation of a Deep Visual "Eclipse" in the WC9-Type Wolf-Rayet Star, WR 76

Rod Stubbings (1) and Peredur Williams (2)

1 - Tetoora Road Observatory, 2643 Warragul-Korumburra Road, Tetoora Road, 3821, Victoria, Australia;
2- Institute for Astronomy, Royal Observatory, Blackford Hill, Edinburgh, EH9 3HJ, United Kingdom

The WC9-Type Wolf-Rayet star WR 76 is one of the most prolific dust makers identified from its infrared emission. WR 76 experienced a deep fading eclipse in 2016. The ~3.1 magnitude depth of the eclipse exceeds fadings in similar eclipses observed in WR stars thus far. Conclusions from recent and earlier analyses of eclipses observed suggests that WR 76 may be a prolific eclipser.

Reference: JAAVSO (in Press)
Status: Manuscript has been accepted

Weblink: https://arxiv.org/ftp/arxiv/papers/1704/1704.05720.pdf

Comments:

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Abstracts of 2 conference proceedings

The evolution of magnetic fields in hot stars

Mary E. Oksala(1,2), Coralie Neiner(2), Cyril Georgy(3), Norbert Przybilla(4), Zsolt Keszthelyi(5,6), Gregg Wade(5), Stephane Mathis(7,2), Aurore Blazere(8,2), Bram Buysschaert(2,9)

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92195 Meudon, France; (3) Geneva Observatory, University of Geneva, chemin des Maillettes 51, 1290 Sauverny, Switzerland; (4) Institut fur Astro- und Teilchenphysik, Universitat Innsbruck, Technikerstr. 25/8, 6020, Innsbruck, Austria; (5) Department of Physics, Royal Military College of Canada, PO Box 17000 Station Forces, Kingston, ON K7K 0C6, Canada; (6) Department of Physics, Engineering Physics and Astronomy, Queen'€ s University, 99 University Avenue, Kingston, ON K7L 3N6, Canada; (7) Laboratoire AIM Paris-Saclay, CEA/DRF - CNRS - Universite Paris Diderot, IRFU/SAp Centre de Saclay, 91191 Gif-sur-Yvette, France; (8) Institut d'Astrophysique et de Geophysique, Universite de Liege, Quartier Agora (B5c), Allee du 6 aout 19c, 4000 Sart Tilman, Liege, Belgium; (9) Instituut voor Sterrenkunde, KU Leuven, Celestijnenlaan 200D, 3001, Leuven, Belgium

Over the last decade, tremendous strides have been achieved in our understanding of magnetism in main sequence hot stars. In particular, the statistical occurrence of their surface magnetism has been established (~10%) and the field origin is now understood to be fossil. However, fundamental questions remain: how do these fossil fields evolve during the post-main sequence phases, and how do they influence the evolution of hot stars from the main sequence to their ultimate demise? Filling the void of known magnetic evolved hot (OBA) stars, studying the evolution of their fossil magnetic fields along stellar evolution, and understanding the impact of these fields on the angular momentum, rotation, mass loss, and evolution of the star itself, is crucial to answering these questions, with far reaching consequences, in particular for the properties of the precursors of supernovae explosions and stellar remnants. In the framework of the BRITE spectropolarimetric survey and LIFE project, we have discovered the first few magnetic hot supergiants. Their longitudinal surface magnetic field is very weak but their configuration resembles those of main sequence hot stars. We present these first observational results and propose to interpret them at first order in the context of magnetic flux conservation as the radius of the star expands with evolution. We then also consider the possible impact of stellar structure changes along evolution.

Reference: Proceeding -- IAUS329
Status: Conference proceedings

Weblink: https://arxiv.org/abs/1702.06924

Comments:

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Massive stars in advanced evolutionary stages, and the progenitor of GW150914

Hamann, W.-R.; Oskinova, L.; Todt, H.; Sander, A.; Hainich, R.; Shenar, T.; Ramachandran, V.

University Potsdam, Germany

The recent discovery of a gravitational wave from the merging of two black holes of about 30 solar masses each challenges our incomplete understanding of massive stars and their evolution. Critical ingredients comprise mass-loss, rotation, magnetic fields, internal mixing, and mass transfer in close binary systems. The imperfect knowledge of these factors implies large uncertainties for models of stellar populations and their feedback. In this contribution we summarize our empirical studies of Wolf-Rayet populations at different metallicities by means of modern non-LTE stellar atmosphere models, and confront these results with the predictions of stellar evolution models. At the metallicity of our Galaxy, stellar winds are probably too strong to leave remnant masses as high as 30 solar masses, but given the still poor agreement between evolutionary tracks and observation even this conclusion is debatable. At the low metallicity of the Small Magellanic Cloud, all WN stars which are (at least now) single are consistent with evolving quasi-homogeneously. O and B-type stars, in contrast, seem to comply with standard

evolutionary models without strong internal mixing. Close binaries which avoided early merging could evolve quasi-homogeneously and lead to close compact remnants of relatively high masses that merge within a Hubble time.

Reference: in: Proceedings of the IAU Symposium No. 329 "The lives and death-throes of massive stars" (in press) - arXiv:1702.05629
Status: Conference proceedings

Weblink: http://www.astro.physik.uni-potsdam.de/~www/research/abstracts/hamann-iau329.html

Comments:

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MEETINGS

XXIX Canary Islands Winter School of Astrophysics "Applications of Radiative Transfer to Stellar and Planetary Atmospheres"

November 13th to 17th, 2017

Venue: La Laguna, Tenerife, Spain

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First announcement of the XXIX Canary Islands Winter School of Astrophysics

Applications of Radiative Transfer to Stellar and Planetary Atmospheres

La Laguna (Tenerife, Spain) -- November 13th to 17th, 2017

Website: www.iac.es/winterschool/2017/

Deadline for both the Registration and Applications is 23rd June 2017

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Since 1989, the Instituto de Astrofísica de Canarias organizes yearly a Winter School whose aim is to train PhD students and recent post-docs in frontier topics of Astrophysics.

The XXIX Canary Islands Winter School of Astrophysics, to be held in San Cristobal de La Laguna (Tenerife, Spain) in November 2017, focuses on Applications of Radiative Transfer to Stellar and Planetary Atmospheres.

The audience will be limited to 50 participants. The aim of this Winter School is to bring together in a relaxed working environment distinguished scientists who, in recent years, have paved the way to major advances in the treatment and applications of radiative transfer and young researchers who want to broaden their knowledge in this specific field of Astrophysics by attending advanced lectures and interchanging acquired expertise and skills among them.

** The deadline for both the Registration and Applications is 23rd June 2017 **

Distinguished specialists in their field of research have been invited to give advanced lectures on the following topics:

* Fundamental physical aspects of radiative transfer
* Mathematical background and computer codes
* Phenomenology and physics of atmospheres of early-type and late-type stars
* Phenomenology and physics of atmospheres of brown dwarfs and extrasolar giant planets
* Near IR high resolution spectroscopy

Lectures will be complemented by tutorial activity consisting in the running of standard computer codes to trace the effects of both physical assumptions and a different choice of key parameters on the stellar spectra synthesized in the case of both hot and cool stars.

Participants will have the opportunity to display their current work by presenting a poster.

The basic registration fee amounts to 350 euros and includes conference fee, welcome cocktail, morning and afternoon coffee during the lecture days, conference dinner, copy of the proceedings, and visit to the Teide observatory on November 18th (including lunch).

An optional daily trip to the Roque de los Muchachos Observatory (La Palma) will be organized on November 19th. The extra cost of 250 euros includes the flights from/to Tenerife/La Palma, transfers, lunch and a guided tour of the principal telescopes.

A limited number of grants will be provided by the organization to cover accommodation (double room - breakfast included - shared with another participant in Hotel Nivaria, a **** hotel in San Cristobal de La Laguna, where teachers and most participants are expected to stay).

Rationale of the school:
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The quantitative analysis of the electromagnetic radiation emitted by astrophysical objects is the unique tool we have at hands for the diagnostics of their physical properties. The study of stellar atmospheres has experienced in the last decades a great step forward, both in theory and computational techniques. However, a well-founded fear is starting to arise that, at the generational turnover, young practitioners in the field may lack in a firm grip on the underlying physics and use the available computer codes as black-boxes. In addition, radiative transfer in Astrophysics is living nowadays a period of transition from old to new fields of applications. Among them the investigation of exoplanets, which implies the quantitative study of planetary atmospheres, and the interpretation of high resolution infrared spectra, for which theoretical progress did not yet go with the impressive technological advances achieved.

Therefore, an advanced school dedicated to the fundamental physical processes in both stellar and planetary atmospheres, as well as the bases of the numerical treatment of radiative transfer, is more timely than ever, both to prevent the risk above mentioned and to form researchers with the background required to face the present and future challenges.

Lectures and topics:
===================

* Artemio Herrero (Instituto de Astrofísica de Canarias, Spain)

>> Fundamental physical aspects of radiative transfer

* Olga Atanackovic (Faculty of Mathematics, Univ. of Belgrade, Servia):

>> Numerical methods in radiative transfer

* Mats Carlsson (Institute of Theoretical Astrophysics, Univ. of Oslo, Norway):

>> Stellar atmosphere codes

* Joachim Puls (Universitaetssternwarte der LMU Munchen, Germany):

>> Radiative transfer in the (expanding) atmospheres of early-type stars, and related problems

* Maria Bergemann (Institute for Astronomy, Heidelberg, Germany):

>> Phenomenology and physics of late-type stars

* Mark S. Marley (NASA Ames Research Center, Space Science & Astrobiology Division, USA):

>> Modeling the atmospheres of brown dwarfs and extrasolar giant planets

* Giuseppe Bono (Dipartamento di Fisica, Univ. di Roma Tor Vergata, Italy):

>> Near IR high resolution spectroscopy

* Carlos Allende Prieto (Instituto de Astrofísica de Canarias, Spain):

>> Tutorial on the application of radiative transfer codes to the cool star domain

* Sergio Simón-Díaz (Instituto de Astrofísica de Canarias, Spain):

>> Tutorial on the application of radiative transfer codes to the hot star domain

Organizing Committee:
====================

L. Crivellari (Co-Director of the School);

S. Simón Díaz (Co-Director of the School);

M. J. Arévalo Morales (Head of the IAC Teaching Department);

R. Rebolo López (Director of the IAC).

Secretariat:
===========

L. González Pérez

Weblink: www.iac.es/winterschool/2017

Email: ssimon@iac.es

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Stars with a stable magnetic field: from pre-main sequence to compact remnants

August 28 - September 01, 2017

Venue: Masaryk University, Brno, Czech Republic

Magnetic fields play an important role in the evolution of all stellar objects, through their ability to influence and alter the angular momentum evolution, internal mixing, activity phenomena, surface abundances and mass-loss of stars. This research field benefits from new highly accurate measurements and numerical simulations, enabling stellar astrophysicists to take magnetic fields into account in most models of stellar structure and evolution. We want to bring together researchers from different fields where magnetic fields play an important role to join their efforts and discuss their common interests.

Main Topics of the Conference:
•Characteristics of surface magnetic fields in early-type stars
•Magnetic fields and the stellar structure and evolution
•Magnetism, accretion and braking of PMS stars
•Surface structure formation in the presence of magnetic field: connection with diffusion and accretion
•Magnetic field origin and stability
•Magnetically-confined winds
•Stellar pulsations in the presence of global magnetic fields
•Post main sequence evolution of early-type magnetic stars
•Final phases of stellar evolution: magnetism in compact objects
•The future of magnetic field measurements in hot stars

The registration is now open. The normal registration fee is 6000 CZK, the reduced fee for students is 3000 CZK and 1500 CZK for accompanying persons.

The proceedings of the conference will be published in the Contributions of the Astronomical Observatory Skalnaté Pleso.

SOC:
•Adela Kawka, AsU, Czech Republic
•Jiří Krtička, MU Brno, Czech Republic
•Coralie Neiner, Observatoire de Paris, France
•Mary Oksala, Observatoire de Paris, France
•Stan Owocki, Univ. Delaware, USA
•Ernst Paunzen (chair), MU Brno, Czech Republic
•Veronique Petit (chair), Florida Institute of Technology, USA
•Olga Pintado, CONICET, Argentina
•Jose Pons, Universitat d'Alacant, Spain
•Gregg Wade, RMC, Canada

Weblink: http://magnetic17.physics.muni.cz/

Email: magnetic17@physics.muni.cz

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Eta Carinae, LBVs, and Supernova Impostors (2nd announcement)

June 19 - 23, 2017

Venue: University of Pittsburgh, Pittsburgh, USA

A five-day workshop which will bring both observational and theoretical researchers together to discuss massive stars, LBVs, and Supernova (SN) Impostors will be held June 19 - 23, 2017 at the University of Pittsburgh.

With the advent of new surveys, many more SN impostors and peculiar SNe are being found. These discoveries are challenging our current understanding of massive star evolution. Some of the questions we intend to address at the workshop are:
What is the relationship between massive stars, LBVs and SN impostors?
What can current observations tell researchers about massive star evolution and instabilities?
Are Type IIn SNe related to classical LBVs or do they arise from another mechanism?
Do LBVs originate from the most massive stars?
Is binarity required for a star to go through the LBV stage?
How important is inflation for massive star outbursts?
How do massive stars influence enrichment leading to molecule and dust formation?

Our tentative schedule, intended to maximize discussion at each stage, will devote the first three to four days to massive stars, LBVs and SN impostors in general. The last one to two days will focus more on Eta Carinae, one of the most enigmatic objects in our local group of galaxies and one of the most massive and luminous stars in our galaxy that is conveniently in the LBV stage. Despite extensive investigations we still have many outstanding questions: Which star underwent the outburst? What caused the outburst? How much material was ejected? What is the enriched ejection telling us about molecules and dust formation? Were there only the 1840s and 1890s events, or were there previous massive ejections in addition to the pre-LBV winds? What is the evolutionary stage of the secondary star?

The workshop will examine how this massive binary fits into our understanding of these questions and discuss the studies, both theoretical and observational, that are needed as the 2020 periastron event approaches. We will also address what other massive stars, LBVs and SN impostors can and should be studied to provide new insights into massive star evolution.

A block of rooms has been reserved at Hilton Garden Inn Pittsburgh in Oakland (Pennsylvania), which is within walking distance of the conference room. Details will be placed on the conference website at http://kookaburra.phyast.pitt.edu/hillier/Eta2017_workshop in the near future. There is no registration fee.

As attendance is limited to approximately 35 participants, all attendees must be approved by the Scientific Organizing Committee. If you are interested in attending the workshop, and in presenting a talk, please send an email to John Hillier at hillier@pitt.edu. Please use the words "Pittsburgh Workshop" in the subject line.

Weblink: http://kookaburra.phyast.pitt.edu/hillier/Eta2017_workshop

Email: hillier@pitt.edu

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Eta Carinae, LBVs, and Supernova Impostors (Second Announcement)

June 19 - 23, 2017

Venue: University of Pittsburgh, Pittsburgh, PA, USA

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Weblink: http://kookaburra.phyast.pitt.edu/hillier/Eta2017_workshop/

Email: hillier@pitt.edu

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Massive Stars as Cosmic Monsters

July 6 2017

Venue: NAM (UK) National Astronomy Meeting (Hull, England)

The discovery of gravitational waves from the merger of two Black Holes -- with masses 30-40 times that of the Sun -- has raised the question of how our Universe was capable of producing such large masses. These stars must have been very massive to begin with, and should not have lost much mass during their lives, hinting at a low metallicity environment.

We propose to bring together experts in blue massive OB, Wolf-Rayet (WR) stars, red supergiants (RSGs), and both canonical and superluminous supernovae (SNe), as well as massive binaries, including high-mass X-ray binaries (HMXBs) and ultra-luminous X-rays sources (ULXs).

We will bring together stellar evolution theorists and observers of massive stars in the Milky Way and the local low-metallicity Universe (LMC, SMC) as well as larger distances at higher redshift, including Ly alpha emitters and Lyman-break galaxies (LBGs) to tackle the question
of how the properties, evolution, and fate of massive stars in the earlier Universe is fundamentally different from that at solar metallicity.

Finally, we will discuss the role of massive stars for the line emission seen in high redshift galaxies and their role in cosmic reionisation.

SOC: Jorick Vink (Chair), Elizabeth Stanway & Ben Davies

Invited speakers:

Jose Groh (Dublin):
"The surprising look of massive stars before death"

Miriam Garcia (Madrid):
"Towards the first (very massive) stars of the Universe: First Stop"

Rebecca Bowler (Oxford):
"No evidence for Population III stars or a Direct Collapse Black Hole in the z = 6.6 Lyman-alpha emitter CR7"

ABSTRACT DEADLINE: *April 14*

Weblink: https://nam2017.org/

Email: jsv@arm.ac.uk

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Be stars in X-ray binaries 2017

11 - 13 Sept 2017

Venue: Heraklion, Crete

On the line of the previous workshops (BeXRB 2011 and BeXRB 2014), a new meeting will take place in Heraklion on 11-13 September 2017.

Be stars, Be disks & models in the context of explaining the BeXRB phenomenon.

Phenomenology of BeXRB transient outbursts in the X-ray domain (normal vs giant, pre-flares, complex shaped outbursts, pulse profiles ...).

Observations in other wavebands and their implications.

BeXRBs in external galaxies compared to the Milky Way population.

The high-energy gamma-ray connection (LS I +61 303, HESS J0632+057 & PSR B1259-63)

Transient outbursts as laboratories of accretion physics.

BeXRBs with Black Hole or White Dwarf companions.

Weblink: https://sites.google.com/site/bexrb2017/

Email: mjcoe@soton.ac.uk

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