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CONTENTS OF THIS NEWSLETTER:

News

Wolf-Rayet Star Catalogue

Abstracts of 16 accepted papers

Revisiting the Rigidly Rotating Magnetosphere model for $sigma$ Ori E. I. Observations and Data Analysis
WR 38/38a and the ratio of total-to-selective extinction in Carina
Near-infrared study of the stellar population of Sh2-152
Spectral modeling of circular massive binary systems: Towards an understanding of the Struve-Sahade effect?
A spectroscopic investigation of early-type stars in the young open cluster Westerlund 2
Nitrogen line spectroscopy of O-stars -- I. Nitrogen III emission line formation revisited
The massive star binary fraction in young open clusters - III. IC 2944 and the Cen OB2 association
A double detached shell around a post-Red Supergiant:IRAS 17163-3907, the Fried Egg nebula
Radio Continuum Emission from FS CMa Stars
Wind structure and luminosity variations in the WR/LBV HD 5980
A Binary Orbit for the Massive, Evolved Star HDE 326823, a WR+O System Progenitor
A multi-epoch XMM-Newton campaign on the core of the massive Cyg OB2 association
Nitrogen line spectroscopy in O-stars -- II. Surface nitrogen abundances for O-stars in the Large Magellanic Cloud
A quantitative study of O stars in NGC2244 and the Mon OB2 association
An obscured cluster associated with the H II region RCW173
X-ray emission from massive stars with magnetic fields

Abstracts of 6 conference proceedings

Completing the Massive Star Population: Striking Into the Field
CoRoT observations of O stars: diverse origins of variability
The IMF of Field OB Stars in the Small Magellanic Cloud
Discovery of a new Wolf-Rayet star using SAGE-LMC
Sparse Aperture Masking of Massive Stars
The nature and consequences of clumping in hot, massive star winds

Meetings

Astrophysics at Extremely High Angular Resolution: Optical and Infrared Interferometry
The Physics of Astronomical Transients
The Evolution of Massive Stars and Progenitors of GRBs
The IR view of massive stars: the main sequence and beyond
Very Massive Stars in the Local Universe

News

Wolf-Rayet Star Catalogue

On-line database of Milky Way Wolf-Rayet stars, updated with respect to VIIth WR Catalogue (van der Hucht 2001, 2006). Catalogue currently includes 547 WR stars, as of October 2011, and is intended to be complementary to Galactic O-star catalog http://gosc.iaa.es/ Please send updates to Paul Crowther.

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Back to contents

PAPERS

Abstracts of 16 accepted papers

Revisiting the Rigidly Rotating Magnetosphere model for $sigma$ Ori E. I. Observations and Data Analysis

M.E. Oksala^{1,2}, G.A. Wade^2, R.H.D. Townsend^{3}, S.P. Owocki^{1}, O. Kochukhov^{4}, C. Neiner^{5}, E. Alecian^{5}, J. Grunhut^{2,6}, and the MiMeS Collaboration

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We have obtained 18 new high-resolution spectropolarimetric observations of the B2Vp star $sigma$ Ori E with both the Narval and ESPaDOnS spectropolarimeters. The aim of these observations is to test, with modern data, the assumptions of the Rigidly Rotating Magnetosphere (RRM) model of Townsend & Owocki (2005), applied to the specific case of $sigma$ Ori E by Townsend et al. (2005). This model includes a substantially offset dipole magnetic field configuration, and approximately reproduces previous observational variations in longitudinal field strength, photometric brightness, and H$alpha$ emission. We analyze new spectroscopy, including H~{sc i}, He~{sc i}, C~{sc ii}, Si~{sc iii} and Fe~{sc iii} lines, confirming the diversity of variability in photospheric lines, as well as the double S-wave variation of circumstellar hydrogen. Using the multiline analysis method of Least-Squares Deconvolution (LSD), new, more precise longitudinal magnetic field measurements reveal a substantial variance between the shapes of the observed and RRM model time-varying field. The phase resolved Stokes~V profiles of He{sc i} 5876 AA~and 6678 AA~lines are fit poorly by synthetic profiles computed from the magnetic topology assumed by Townsend et al. (2005). These results challenge the offset dipole field configuration assumed in the application of the RRM model to $sigma$ Ori E, and indicate that future models of its magnetic field should also include complex, higher-order components.

Reference: MNRAS
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1109.0328

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Back to contents

WR 38/38a and the ratio of total-to-selective extinction in Carina

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A reanalysis of the (seemingly very distant) open cluster Shorlin 1, the group of stars associated with WR 38 and WR 38a, is made on the basis of existing UBV and JHKs observations for cluster members. The 2MASS observations, in particular, imply a mean cluster reddening of E(B-V)=1.45+-0.07 and a distance of 2.94+-0.12 kpc. The reddening agrees with the UBV results provided that the local reddening slope is described by E(U-B)/E(B-V)=0.64+-0.01, but the distance estimates in the 2MASS and UBV systems agree only if the ratio of total-to-selective extinction for the associated dust is R=Av/E(B-V)=4.0+-0.1. Both results are similar to what has been obtained for adjacent clusters in the Eta Carinae region by similar analyses, which suggests that `anomalous' dust extinction is widespread through the region, particularly for groups reddened by relatively nearby dust. Dust associated with the Eta Carinae complex itself appears to exhibit more `normal' qualities. The results have direct implications for the interpretation of distances to optical spiral arm indicators for the Galaxy at l=287-291 degrees, in particular the Carina arm here is probably little more than ~2 kpc distant, rather than 2.5-3 kpc distant as implied in previous studies. Newly-derived intrinsic parameters for the two cluster Wolf-Rayet stars WR 38 (WC4) and WR

38a (WN5) are in good agreement with what is found for other WR stars in Galactic open clusters, which was not the case previously.

Reference: Ap&SS
Status: Manuscript has been accepted

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Back to contents

Near-infrared study of the stellar population of Sh2-152

S. Ramírez Alegría (1,2), A. Herrero (1,2), A. Marín-Franch (3,4), E. Puga (5), F. Najarro (5), J. A. Acosta Pulido (1,2), S. L. Hidalgo (1,2), and S. Simón-Díaz (1,2)

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Context: The discovery of new massive star clusters and massive stellar populations in previously known clusters in our Galaxy by means of infrared studies has changed our view of the Milky Way from an inactive to an active star-forming machine. Within this scenario, we present a near-infrared spectrophotometric study of the stellar content of the compact H II region Sh2-152.

Aims: We aim to determine the distance, extinction, age, and mass of Sh2-152, using for the first time near-infrared stellar classification for several sources in the region.

Methods: Using our near-infrared (J, H, and Ks) photometry and the colour-magnitude diagram for the cluster field, we selected 13 bright stars, candidate members of the reddened cluster's main sequence, for H- and K- spectroscopy and spectral classification. This near-infrared information was complemented with an optical spectrum of the ionizing central star to confirm its spectral nature.

Results: From the 13 spectroscopically observed stars, 5 were classified as B-type, 3 as G-type, 2 were young stellar objects (YSOs), and 3 remained unclassified (because of the poor data quality). The cluster's extinction varies from A_(Ks)=0.5 to 2.6 magnitudes (A_V=4.5 to 24 magnitudes) and the distance is estimated to be 3.21±0.21 kpc. The age of the cluster is younger than 9.4 Myr and the lower limit to the total mass of the cluster is $(2.45\pm0.79)\cdot10^3$ M_(Sun). We compare the number of ionizing photons emitted from the OB-type stars with the Lyman continuum photons derived from the radio observations and conclude that both quantities are consistent for the central region of Sh2-152. In contrast, the main ionizing source of the lower region remains unidentified.

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Weblink: http://arxiv.org/abs/1108.6258

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Back to contents

Spectral modeling of circular massive binary systems: Towards an understanding of the Struve-Sahade effect?

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Context: Some secondary effects are known to introduce variations in spectra of massive binaries. These phenomena (such as the Struve-Sahade effect, difficulties to determine properly the spectral type,...) have been reported and documented in the literature. Aims: We simulate the spectra of circular massive binaries at different phases of the orbital cycle and accounting for the gravitational influence of the companion star on the shape and physical properties of the stellar surface. Methods: We use the Roche potential to compute the stellar surface, von Zeipel theorem and reflection effects to compute the surface temperature. We then interpolate in a grid of NLTE plan-parallel atmosphere model spectra to obtain the local spectrum at each surface point. We finally sum all the contributions (accounting for the Doppler shift, limb-darkening, ...) to obtain the total spectrum. The computation is done for different orbital phases and for different sets of physical and orbital parameters. Results: Our first models reproduce the Struve-Sahade effect for several lines. Another effect, surface temperature distribution is visible but the distribution predicted by our current model is not yet consistent with observations. Conclusions: In some cases, the Struve-Sahade effect as well as more complex line intensity variations could be linked to blends of intrinsically asymmetric line profiles that are not appropriately treated by the deblending routine. Systematic variations of lines for (nearly) contact systems are also predicted by the model.

Reference: Astronomy & Astrophysics
Status: Manuscript has been accepted

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Back to contents

A spectroscopic investigation of early-type stars in the young open cluster Westerlund 2

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The distance of the very young open cluster Westerlund 2, which contains the very massive binary system WR 20a and is likely associated with a TeV source, has been the subject of much debate. We attempt a joint analysis of spectroscopic and photometric data of eclipsing binaries in the cluster to constrain its distance. A sample of 15 stars, including three eclipsing binaries (MSP 44, MSP 96, and MSP 223) was monitored with the FLAMES multi-object spectrograph. The spectroscopic data are analysed together with existing BV photometry. The analysis of the three eclipsing binaries clearly supports the larger

values of the distance, around 8 kpc, and rules out values of about 2.4 - 2.8 kpc that have been suggested in the literature. Furthermore, our spectroscopic monitoring reveals no clear signature of binarity with periods shorter than 50 days in either the WN6ha star WR 20b, the early O-type stars MSP 18, MSP 171, MSP 182, MSP 183, MSP 199, and MSP 203, or three previously unknown mid O-type stars. The only newly identified candidate binary system is MSP 167. The absence of a binary signature is especially surprising for WR 20b and MSP 18, which were previously found to be bright X-ray sources. The distance of Westerlund 2 is confirmed to be around 8 kpc as previously suggested based on the spectrophotometry of its population of O-type stars and the analysis of the light curve of WR 20a. Our results suggest that short-period binary systems are not likely to be common, at least not among the population of O-type stars in the cluster.

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Back to contents

Nitrogen line spectroscopy of O-stars -- I. Nitrogen III emission line formation revisited

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Context: Evolutionary models of massive stars predict a surface enrichment of Nitrogen, due to rotational mixing. Recent studies within the VLT-FLAMES survey of massive stars have challenged (part of) these predictions. Such systematic determinations of Nitrogen abundances, however, have been mostly performed only for cooler (B-type) objects. For the most massive and hottest stars, corresponding results are scarce.

Aims: This is the first paper in a series dealing with optical Nitrogen spectroscopy of O-type stars, aiming at the analysis of Nitrogen abundances for stellar samples of significant size, to place further constraints on the early evolution of massive stars. Here we concentrate on the formation of the optical NIII lines at lambda lambda 4634/40/42 A that are fundamental for the definition of the different morphological `f'-classes.

Methods: We implement a new Nitrogen model atom into the NLTE atmosphere/spectrum synthesis code FASTWIND, and compare the resulting optical NIII spectra with other predictions, mostly from the seminal work by Mihalas & Hummer (1973, ApJ 179, 827, `MH'), and from the alternative code CMFGEN.

Results: Using similar model atmospheres as MH (not blanketed and wind-free), we are able to reproduce their results, in particular the optical triplet emission lines. According to MH, these should be strongly related to dielectronic recombination and the drain by certain two-electron transitions. However, using realistic, fully line-blanketed atmospheres at solar abundances, the key role of the dielectronic recombinations controlling these emission features is superseded -- for O-star conditions -- by the

strength of the stellar wind and metallicity. Thus, in the case of wind-free (weak wind) models, the resulting lower ionizing EUV-fluxes severely suppress the emission. As the mass loss rate is increased, pumping through the NIII resonance line(s) in the presence of a near-photospheric velocity field (i.e., the Swings-mechanism) results in a net optical triplet line emission. A comparison with results from CMFGEN is mostly satisfactory, except for the range 30,000 K < Teff < 35,000 K, where CMFGEN triggers the triplet emission at lower Teff than FASTWIND. This effect could be traced down to line overlap effects between the NIII and OIII resonance lines that cannot be simulated by FASTWIND so far, due to the lack of a detailed OIII model atom.

Conclusions: Since the efficiency of dielectronic recombination and `two electron drain' strongly depends on the degree of line-blanketing/-blocking, we predict the emission to become stronger in a metal-poor environment, though lower wind-strengths and Nitrogen abundances might counteract this effect. Weak winded stars (if existent in the decisive parameter range) should display less triplet emission than their counterparts with `normal' winds.

Reference: Astronomy and Astrophysics, in press
Status: Manuscript has been accepted

Weblink: http://www.usm.uni-muenchen.de/people/puls/papers/paper_niii.pdf

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Back to contents

The massive star binary fraction in young open clusters - III. IC 2944 and the Cen OB2 association

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Using an extended set of multi-epoch high-resolution high signal-to-noise ratio optical spectra, we readdress the multiplicity properties of the O-type stars in IC 2944 and in the Cen OB2 association. We present new evidence of binarity for five objects and we confirm the multiple nature of another two. We derive the first orbital solutions for HD 100099, HD 101436 and HD 101190 and we provide additional support for HD 101205 being a quadruple system. The minimal spectroscopic binary fraction in our sample is f_min= 0.57. Using numerical simulations, we show that the detection rate of our observational campaign is close to 90 per cent, leaving thus little room for undetected spectroscopic binary systems. The statistical properties of the O-star population in IC 2944 are similar, within the uncertainties, to the results obtained in the earlier papers in this series despite the fact that sample size effects limit the significance of the comparison. Using newly derived spectroscopic parallaxes, we reassess the distance to IC 2944 and obtained 2.3 +/- 0.3 kpc, in agreement with previous studies. We also confirm that, as far as the O stars are concerned, the IC 2944 cluster is most likely a single entity.

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Status: Manuscript has been accepted

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Back to contents

A double detached shell around a post-Red Supergiant:IRAS 17163-3907, the Fried Egg nebula

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We performed a mid-infrared imaging survey of evolved stars in order to study the dust distribution in circumstellar envelopes around these objects and to better understand the mass-loss mechanism responsible for the formation of these envelopes. During this survey, we resolved for the first time the circumstellar environment of IRAS 17163-3907 (hereinafter IRAS17163), which is one of the brightest objects in the mid-infrared sky, but is surprisingly not well studied. Our aim is to determine the evolutionary status of IRAS 17163 and study its circumstellar environment in order to understand its mass-loss history. We obtained diffraction-limited images of IRAS 17163 in the mid-infrared using VISIR on the VLT. Optical spectra of the object allowed us to determine its spectral type and estimate its distance via the presence of diffuse interstellar bands. We show that IRAS 17163 is a Post-Red Supergiant, possibly belonging to the rare class of Yellow Hypergiants, and is very similar to the well studied object IRC +10420. Our mid-infrared images of IRAS 17163 are the first direct images of this bright mid-infrared source. These images clearly show the presence of a double dusty detached shell around the central star, due to successive ejections of material with a timescale of the order of 400 years and a total circumstellar mass larger than 4 M$_{odot}$. This indicates that non quiescent mass-loss occurs during this phase of stellar evolution.

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Back to contents

Radio Continuum Emission from FS CMa Stars

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The FS CMa stars exhibit bright optical emission-line spectra and strong IR excesses. Very little is known of their radio characteristics.We analyzed archive Very Large Array data to search for radio continuum emission in a sample of them. There are good quality data for seven of the sim40 known FS CMa stars. Of these seven stars, five turn out to have associated radio emission. Two of these stars, CI Cam and MWC 300, have been previously reported in the literature as radio emitters. We present and briefly discuss the radio detection of the other three sources: FS CMa (the prototype of the class), AS 381, and MWC 922. The radio emission is most probably of a free-free nature but additional observations are required to better characterize it.

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Back to contents

Wind structure and luminosity variations in the WR/LBV HD 5980

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Over the past 40 years, the massive LBV/WR system HD 5980 in the Small Magellanic Cloud has undergone a long-term S Doradus type variability cycle and two brief and violent eruptions in 1993 and 1994. In this paper we analyze a collection of UV and optical spectra obtained between 1979 and 2009

and perform CMFGEN model fits to spectra of 1994, 2000, 2002 and 2009. The results are as follows: a) The long term S Dor-type variability is associated with changes of the hydrostatic radius; b) The 1994 eruption involved changes in its bolometric luminosity and wind structure; c) the emission-line strength, the wind velocity and the continuum luminosity underwent correlated variations in the sense that a decreasing V$_infty$ is associated with increasing emission line and continuum levels; and d) The spectrum of the third star in the system ({it Star C}) is well-fit by a T$_{eff}$=32 K model atmosphere with SMC chemical abundances.

For all epochs, the wind of the erupting star is optically thick at the sonic point and is thus driven mainly by the continuum opacity. We speculate that the wind switches between two stable regimes driven by the ``hot" (during the eruption) and the ``cool" (post-eruption) iron opacity bumps as defined by Lamers & Nugis (2002) and Gr"afener and Hamann (2008), and thus the wind may undergo a bi-stability jump of a different nature from that which occurs in OB-stars.

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Status: Manuscript has been accepted

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Back to contents

A Binary Orbit for the Massive, Evolved Star HDE 326823, a WR+O System Progenitor

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The hot star HDE 326823 is a candidate transition-phase object that is evolving into a nitrogen-enriched Wolf-Rayet star. It is also a known low-amplitude, photometric variable with a 6.123 d period. We present new, high and moderate resolution spectroscopy of HDE 326823, and we show that the absorption lines show coherent Doppler shifts with this period while the emission lines display little or no velocity variation. We interpret the absorption line shifts as the orbital motion of the apparently brighter star in a close, interacting binary. We argue that this star is losing mass to a mass gainer star hidden in a thick accretion torus and to a circumbinary disk that is the source of the emission lines. HDE 326823 probably belongs to a class of objects that produce short-period WR+O binaries.

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Comments: 32 pages, including 3 tables and 10 figures.

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Back to contents

A multi-epoch XMM-Newton campaign on the core of the massive Cyg OB2 association

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Cyg OB2 is one of the most massive associations of O-type stars in our Galaxy. Despite the large interstellar reddening towards Cyg OB2, many studies, spanning a wide range of wavelengths, have been conducted to more clearly understand this association. X-ray observations provide a powerful tool to overcome the effect of interstellar absorption and study the most energetic processes associated with the stars in Cyg OB2. We analyse XMM-Newton data to investigate the X-ray and UV properties of massive O-type stars as well as low-mass pre-main sequence stars in Cyg OB2. We obtained six XMM-Newton observations of the core of Cyg OB2. In our analysis, we pay particular attention to the variability of the X-ray bright OB stars, especially the luminous blue variable candidate Cyg OB2 #12. We find that X-ray variability is quite common among the stars in Cyg OB2. Whilst short-term variations are restricted mostly to low-mass pre-main sequence stars, one third of the OB stars display long-term variations. The X-ray flux of Cyg OB2 #12 varies by 37%, over timescales from days to years, whilst its mean log(L_X/L_bol) amounts to -6.10. These properties suggest that Cyg OB2 #12 is either an interacting-wind system or displays a magnetically confined wind. Two other X-ray bright O-type stars (MT91 516 and CPR2002 A11) display variations that suggest they are interacting wind binary systems.

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Back to contents

Nitrogen line spectroscopy in O-stars -- II. Surface nitrogen abundances for O-stars in the Large Magellanic Cloud

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Context. Nitrogen is a key element to test the impact of rotational mixing on evolutionary models of massive stars. Recent studies of the nitrogen surface abundance in B-type stars within the VLT-FLAMES survey of massive stars have challenged part of the corresponding predictions. To obtain a more complete picture of massive star evolution, and to allow for further constraints, these studies need to be extended to O-stars.

Aims. This is the second paper in a series aiming at the analysis of nitrogen abundances in O-type stars, to enable further constraints on the early evolution of massive stars. In this paper, we investigate the NIV lambda4058 emission line formation, provide nitrogen abundances for a substantial O-star sample in the

Large Magellanic Cloud, and compare our (preliminary) findings with recent predictions from stellar evolutionary models.

Methods. Stellar and wind parameters of our sample stars are determined by line profile fitting of hydrogen, helium and nitrogen lines, exploiting the corresponding ionization equilibria. Synthetic spectra are calculated by means of the NLTE atmosphere/spectrum synthesis code FASTWIND, using a new nitrogen model atom. We derive nitrogen abundances for 20 O- and 5 B-stars, by analyzing all nitrogen lines (from different ionization stages) present in the
available optical spectra.

Results. The dominating process responsible for emission at NIV lambda 4058 in O-stars is the strong depopulation of the lower level of the transition, which increases as a function of Mdot. Unlike the NIII triplet emission, resonance lines do not play a role for typical mass-loss rates and below. We find (almost) no problem in fitting the nitrogen lines, in particular the `f' features. Only for some objects, where lines from NIII/NIV/NV are visible in parallel, we need to opt for a compromise solution.

For five objects in the early B-/late O-star domain which have been previously analyzed by different methods and model atmospheres, we derive consistent nitrogen abundances. The bulk of our sample O-stars seems to be strongly nitrogen-enriched, and a clear correlation of nitrogen and helium enrichment is found. By comparing the nitrogen abundances as a function of vsini ('Hunter-plot') with tailored evolutionary calculations, we identify a considerable number of highly enriched objects at low rotation.

Conclusions. Our findings seem to support the basic outcome of previous B-star studies within the VLT-FLAMES survey. Due to the low initial abundance, the detection of strong Nitrogen enrichment in the bulk of O-stars indicates that efficient mixing takes place already during the very early phases of stellar evolution of LMC O-stars. For tighter constraints, however, upcoming results from the VLT-FLAMES Tarantula survey need to be waited for, comprising a much larger number of O-stars that will be analyzed based on similar methods as presented here.

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Weblink: http://www.usm.uni-muenchen.de/people/puls/electronic_prints.html

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Back to contents

A quantitative study of O stars in NGC2244 and the Mon OB2 association

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Our goal is to determine the stellar and wind properties of seven O stars in the cluster NGC2244 and three O stars in the OB association MonOB2. These properties give us insight into the mass loss rates of O stars, allow us to check the validity of rotational mixing in massive stars, and to better understand the effects of the ionizing flux and wind mechanical energy release on the surrounding interstellar medium and its influence on triggered star formation. We collect optical and UV spectra of the target stars which are analyzed by means of atmosphere models computed with the code CMFGEN. The spectra of binary

stars are disentangled and the components are studied separately. All stars have an evolutionary age less than 5 million years, with the most massive stars being among the youngest. Nitrogen surface abundances show no clear relation with projected rotational velocities. Binaries and single stars show the same range of enrichment. This is attributed to the youth and/or wide separation of the binary systems in which the components have not (yet) experienced strong interaction. A clear trend of larger enrichment in higher luminosity objects is observed, consistent with what evolutionary models with rotation predict for a population of O stars at a given age. We confirm the weakness of winds in late O dwarfs. In general, mass loss rates derived from UV lines are lower than mass loss rates obtained from Ha. The UV mass loss rates are even lower than the single line driving limit in the latest type dwarfs. These issues are discussed in the context of the structure of massive stars winds. The evolutionary and spectroscopic masses are in agreement above 25 Msun but the uncertainties are large. Below this threshold, the few late-type O stars studied here indicate that the mass discrepancy still seems to hold.

Reference: Astronomy and Astrophysics, in press
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1110.4509

Comments:

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Back to contents

An obscured cluster associated with the H II region RCW173

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The discovery of several clusters of red supergiants towards l = 24°−30° has triggered interest in this area of the Galactic plane, where lines of sight are very complex and previous explorations of the stellar content were very preliminary.

We attempt to characterise the stellar population associated with the HII region RCW 173 (=Sh2-60), located at , as previous studies have suggested that this population could be beyond the Sagittarius arm.

We obtained UBV photometry of a stellar field to the south of the brightest part of RCW 173, as well as spectroscopy of about twenty stars in the area. We combined our new data with archival 2MASS near-infrared photometry and Spitzer/GLIMPSE imaging and photometry, to achieve a more accurate characterisation of the stellar sources and the associated cloud.

We find a significant population of early-type stars located at d = 3.0 kpc, in good agreement with the “near” dynamical distance to the H II region. This population should be located at the near intersection of the Scutum-Crux arm. A luminous O7 II star is likely to be the main source of ionisation. Many stars are concentrated around the bright nebulosity, where GLIMPSE images in the mid infrared show the presence of a bubble of excited material surrounding a cavity that coincides spatially with a number of B0-1 V stars. We interpret this as an emerging cluster, perhaps triggered by the nearby O7 II star. We also find a number of B-type giants. Some of them are located at approximately the same distance, and may be part of an older population in the same area, characterised by much lower reddening. A few have shorter distance moduli and are likely to be located in the Sagittarius arm.

The line of sight in this direction is very complex. Optically visible tracers delineate two spiral arms, but seem to be absent beyond d ≈ 3 kpc. Several HII regions in this area suggest that the Scutum-Crux arm

contains thick clouds actively forming stars. All these populations are projected on top of the major stellar complex signposted by the clusters of red supergiants.

Reference: Astronomy & Astrophysics, Vol 534, A114
Status: Manuscript has been accepted

Weblink: http://www.aanda.org/index.php?option=com_article&access=standard&Itemid=129&url=/articles/aa/abs/2011/10/aa17142-11/aa17142-11.html

Comments:

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Back to contents

X-ray emission from massive stars with magnetic fields

L. M. Oskinova, W. -R. Hamann, J. P. Cassinelli, J. C. Brown, H. Todt

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We investigate the connections between the magnetic fields and the X-ray emission from massive stars. Our study shows that the X-ray properties of known strongly magnetic stars are diverse: while some comply to the predictions of the magnetically confined wind model, others do not. We conclude that strong, hard, and variable X-ray emission may be a sufficient attribute of magnetic massive stars, but it is not a necessary one. We address the general properties of X-ray emission from "normal" massive stars, especially the long standing mystery about the correlations between the parameters of X-ray emission and fundamental stellar properties. The recent development in stellar structure modeling shows that small scale surface magnetic fields may be common. We suggest a "hybrid" scenario which could explain the X-ray emission from massive stars by a combination of magnetic mechanisms on the surface and shocks in the stellar wind. The magnetic mechanisms and the wind shocks are triggered by convective motions in sub-photospheric layers. This scenario opens the door for a natural explanation of the well established correlation between bolometric and X-ray luminosities.

Reference: Accepted AN. 2011 Potsdam Thinkshop "Magnetic Fields in Stars and Exoplanets"
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1110.5345

Comments:

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Back to contents

Abstracts of 6 conference proceedings

Completing the Massive Star Population: Striking Into the Field

M. S. Oey and J. B. Lamb

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As a population, field massive stars are relatively enigmatic, and this review attempts to illuminate this sector of the high-mass stellar population, which comprises 20 -- 25% of the massive stars in star-forming galaxies. The statistical properties of the field population are vital diagnostics of star formation theory, cluster dynamical evolution, and stellar evolution.
We present evidence that field massive stars originate both in situ and as runaways from clusters, based on the clustering law, IMF, rotation velocities, and individual observed in situ candidate field stars. We compare the known properties of field and cluster massive stars from studies in the Magellanic Clouds and the Galaxy, including our RIOTS4 complete spectroscopic survey of SMC OB stars. In addition to the origin of the field massive stars, we discuss additional properties including binarity, runaway mechanisms, and some evolved spectral types.

Reference: Four Decades of Research on Massive Stars, eds. L. Drissen, C. Robert, and N. St.-Louis, ASP Conference Series
Status: Conference proceedings

Weblink: http://adsabs.harvard.edu/abs/2011arXiv1109.0759

Comments: Invited review

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Back to contents

CoRoT observations of O stars: diverse origins of variability

R. Blomme, M. Briquet, P. Degroote, L. Mahy, C. Aerts, J. Cuypers, M. Godart, E. Gosset, M. Hareter, J. Montalban, T. Morel, M.F. Nieva, A. Noels, R. Oreiro, E. Poretti, N. Przybilla, M. Rainer, G. Rauw, F. Schiller, S. Simon-Diaz, K. Smolders, P. Ventura, M. Vuckovic, M. Auvergne, A. Baglin, F. Baudin, C. Catala, E. Michel and R. Samadi

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Six O-type stars were observed continuously by the CoRoT satellite during a 34.3-day run. The unprecedented quality of the data allows us to detect even low-amplitude stellar pulsations in some of these stars (HD 46202 and the binaries HD 46149 and Plaskett's star). These cover both opacity-driven modes and solar-like stochastic oscillations, both of importance to the asteroseismological modelling of O stars. Additional effects can be seen in the CoRoT light curves, such as binarity and rotational modulation. Some of the hottest O-type stars (HD 46223, HD 46150 and HD 46966) are dominated by the presence of red-noise: we speculate that this is related to a sub-surface convection zone.

Reference: To be published in "Four decades of Research on Massive Stars", Astronomical Society of the Pacific. Eds. C. Robert, N. St-Louis and L. Drissen
Status: Conference proceedings

Weblink: http://arxiv.org/abs/1109.1999

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Back to contents

The IMF of Field OB Stars in the Small Magellanic Cloud

J. B. Lamb, M. S. Oey, A. S. Graus, and D. M. Segura-Cox

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The population of field OB stars are an important component of a galaxy's stellar content, representing 20-30% of the massive stars. To study this population, we have undertaken the Runaways and Isolated O Type Star Spectroscopic Survey of the SMC (RIOTS4). RIOTS4 surveys a spatially complete sample of >350 field OB stars in the Small Magellanic Cloud and will serve as a key probe of runaways, binaries, and the stellar IMF in the field massive star population. Here, we focus on the field IMF, which provides an empirical probe of the star-forming process and is a fundamental property of a stellar population. Together with photometry from the OGLE survey, RIOTS4 will yield a definitive stellar IMF for the SMC field massive star population. We present preliminary results that suggests the field IMF is much steeper, Gamma = 2.9, than the canonical stellar IMF of Gamma = 1.35. Despite the steep slope, we see no evidence of a stellar upper mass limit, up to our highest mass star of 65 solar masses.

Reference: Four Decades of Research on Massive Stars, eds. L. Drissen, C. Robert, and N. St-Louis, ASP Conference Series
Status: Conference proceedings

Weblink: http://arxiv.org/abs/1109.6655

Comments:

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Back to contents

Discovery of a new Wolf-Rayet star using SAGE-LMC

V.V. Gvaramadze (1), A.-N. Chené (2,3), A.Y. Kniazev (4,1), O. Schnurr (5)

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We report the first-ever discovery of an extragalactic Wolf-Rayet (WR)
star with Spitzer. A new WR star in the Large Magellanic Cloud (LMC) was revealed
via detection of its circumstellar shell using 24 μm images obtained in the framework of
the Spitzer Survey of the Large Magellanic Cloud (SAGE-LMC). Subsequent spectroscopic

observations with the Gemini South resolved the central star in two components, one of which is a WN3b+abs star, while the second one is a B0V star. We consider the lopsided brightness distribution over the circumstellar shell as an indication that the WR star is a runaway and use this interpretation to identify a possible parent cluster of the star.

Reference: To be published in the proceedings of the meeting 'Four decades of research on massive stars' in honor of Tony Moffat, 11-15 July 2011, Saint-Michel-des-Saints, Quebec
Status: Conference proceedings

Weblink: http://arxiv.org/abs/1110.0126

Comments:

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Back to contents

Sparse Aperture Masking of Massive Stars

H. Sana [1], S. Lacour [2], J.-B. Le Bouquin [3], A. de Koter [1,4], C. Moni Bidin [5], L. Muijres[1], O. Schnurr[6], H. Zinnecker [7,8]

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7. Deutsches SOFIA Institute, Stuttgart, Germany
8. SOFIA Science Center, NASA-Ames Research Center, Moffett Field, CA, USA

We present the earliest results of our NACO/VLT sparse aperture masking (SAM) campaign to search for binarity in a sample of 60 O-type stars. We detect Delta Ks < 5 mag companions for 20-25% of our targets with separations in the range 30-100 mas (typically, 40 - 200 A.U.). Most of these companions were unknown, shedding thus new light on the multiplicity properties of massive stars in a separation and brightness regime that has been difficult to explore so far. Adding detections from other techniques (spectroscopy, interferometry, speckle, lucky imaging, AO), the fraction of O stars with at least one companion is 85% (51/60 targets). This is the largest multiplicity fraction ever found.

Reference: To be published in the proceedings of the meeting 'Four decades of research on massive stars' in honor of Tony Moffat, 11-15 July 2011, Saint-Michel-des-Saints, Quebec
Status: Conference proceedings

Weblink: http://arxiv.org/abs/1109.6654

Comments:

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Back to contents

The nature and consequences of clumping in hot, massive star winds

Jon O. Sundqvist(1), Stanley P. Owocki(1), and Joachim Puls(2)

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This review describes the evidence for small scale structure, `clumping', in the radiation line-driven winds of hot, massive stars. In particular, we focus on examining to what extent simulations of the strong instability inherent to line-driving can explain the multitude of observational evidence for wind clumping, as well as on how to properly account for extensive structures in density and velocity when interpreting the various wind diagnostics used to derive mass-loss rates.

Reference: Invited review to appear in "Four Decades of Research on Massive Stars" in honor of Tony Moffat, ASP Conf. Ser.
Status: Conference proceedings

Weblink: http://arxiv.org/abs/1110.0485

Comments: 8 pages, 3 figures

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Back to contents

MEETINGS

Astrophysics at Extremely High Angular Resolution: Optical and Infrared Interferometry

Friday November 11 2011, 10:30-15:30

Venue: The Geological Society, Burlington House, LONDON,W1J 0BG, UK

We'd like to announce a one day RAS Specialist Discussion meeting on Astrophysics at Extremely High Angular Resolution: Optical and Infrared Interferometry

The new century has seen a quantum leap in the field of optical and infrared long-baseline interferometry, with facilities such as the CHARA and VLTI arrays now routinely producing images with milliarcsecond resolution. As a result, over the past ten years, ground-based optical/IR interfometry has transitioned to become a mainstream, common-user, technique offering unprecedented insights into a wide range of astrophysical phenomena. These include asteroseismology, YSO accretion, photosphere dynamics, exoplanet characterization, and the structure of AGN cores.

This meeting will bring together experts and novices in the field to present their latest scientific results, and to highlight the existing and upcoming capabilities at facility class arrays such as the VLTI. We hope to attract not only attendees who are excited by the possibilities that interferometric methods can bring to their research, but also those who wish to find out more and assess the investment of their time needed to best exploit the UK's access to European and American interferometric arrays.

You can find more information, including a preliminary program on the website.

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Chris Haniff (Cambridge) cahm at rao.cam.ac.uk

Weblink: http://www.ast.leeds.ac.uk/~roud/rasmeet2012.htm

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Back to contents

The Physics of Astronomical Transients

Jan 21 - 27, 2012

Venue: Aspen Center for Physics

This meeting will focus on issues related to the physics and discovery of astronomical transients. Topics will range from the extragalactic: detection of gamma-ray bursts, and supernovae in distant galaxies, variable AGN, to the galactic: variable stars, novae, and other cataclysmic events.

We have now set up the webpage for registration and abstract submission: http://www.aspenphys.org/

You may also express a preference for either an oral or poster presentation. All talks will be invited talks, selected by the organizers from the submitted abstracts. Registration and abstracts are due by October 30, 2011.

We look forward to seeing you in Aspen, CO, for a lively scientific program and an upbeat discussion on innovative exploration strategies and novel theoretical work.

Sincerely

Organizers
Enrico Ramirez-Ruiz, University of California, Santa Cruz
Fred Rasio, Northwestern University
Natalia Ivanova, University of Alberta
Shri Kulkarni, California Institute of Technology

Weblink: http://www.aspenphys.org/

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Back to contents

The Evolution of Massive Stars and Progenitors of GRBs

June 17 - July 1

Venue: Aspen Center for Physics, Aspen, CO

Long-duration gamma-ray bursts (LGRBs), associated with the core-collapse deaths of unusual massive stars, are the fleeting signatures of extraordinarily high-energy events occurring throughout our universe. These phenomena hold enormous promise as cosmological tools, but the full potential of LGRBs cannot be realized without first gaining a thorough understanding of their massive stellar progenitors. Recent advances in the massive star community on binarity, mass loss, and the effects of metallicity are all critical to current debates surrounding the nature of LGRB progenitors. Simultaneously, new results in the LGRB community have yielded important insights into the physical properties, environmental dependences, and interior structures of the most extreme massive stars. However, the study of massive stellar evolution and the study of LGRBs have long been seen as separate pursuits within astronomy, with only limited communication between the two subfields. This multi-disciplinary workshop will bring together leaders in these complementary disciplines, offering an opportunity for participants to exchange expertise, share recent results, and consider the most pressing current questions that will shape the future of LGRB and massive star research for years to come.

Weblink: http://casa.colorado.edu/~emle6425/aspen/

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Back to contents

The IR view of massive stars: the main sequence and beyond

August 2012

Venue: IAU GA in Beijing

Though multiwavelength astronomy was born about fifty years ago, the full use of multiwavelength diagnostics is quite recent. Even in the last decade, astronomers still mostly relied on the optical domain. This is certainly going to change, as most current and future instruments are dedicated to the infrared, from the near- to the far-IR bands.

While this domain is a known "must" for low-mass stars, especially the very low-mass ones, the infrared emission of high-mass stars has been often neglected. Many advantages of the infrared must however be underlined, like its strong potential for circumstellar material and atmosphere diagnostics, and its insensitivity to obscuration. Its interest with regards to the first generation of stars, thought to be very massive, is also well known.

It is thus important to discuss the results obtained for massive stars from existing IR facilities (VLTs/VLTI, Spitzer, Herschel, CRIRES, GAIA, ...) as well as tools for interpreting IR data (e.g. atmosphere modeling) and observing capabilities of future facilities (ELTs, JWST, ...). To this aim, we will hold a 1.5-day special session (SpS) at the next IAU General Assembly meeting in Beijing.

Topics to be presented during this special session:
- Obscured and distant clusters
- Stellar and wind parameters
- Matter ejection and feedback

Note there will also be a joint discussion on 'Very Massive Stars in the Local Universe' during the same GA.

Weblink: http://www.gaphe.ulg.ac.be/IAU_XXVIII/index.html

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Back to contents

Very Massive Stars in the Local Universe

August 2012

Venue: IAU GA in Beijing

While Very Massive Stars (VMS) with over 100 solar masses have been claimed to exist in the early Universe, recent studies discussing the existence and deaths of stars up to 300 solar masses in the local Universe came as a surprise to many workers both inside and outside the field. Before the full implications of these findings can be explored, it is imperative to discuss the various lines of evidence for VMS.

We hold a 1.5-day Joint Discussion -- spread over 3 days -- at the next IAU GA to discuss the determination of both the current and final masses of VMS. The aim is to reach broad consensus between observers and theorists on how to identify and quantify the importance of the dominant physical processes.

Topics to be presented during the JD:
- Weighing the most massive stars from their binary motions
- Stellar spectra of O and Wolf-Rayet stars
- Mass determinations from stellar spectroscopy and model atmosphere analysis
- Formation of the most massive stars
- Mass loss mechanisms, incl. eruptions of Luminous Blue Variables
- Stellar structure and evolution modelling
- The fate of the most massive stars (over cosmological time)
- Mass and energy return to the interstellar medium (ISM)

Note there will also be a special session on 'The infrared view of massive stars
' during the same GA.

Weblink: http://www.arm.ac.uk/IAU/

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Back to contents