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Abstract of recently accepted papers

Spectra of planetary nebulae in NGC 5128 (Centaurus-A)

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Low dispersion spectra have been obtained of five planetary nebulae in the elliptical galaxy NGC 5128 (Centaurus-A) from the catalogue of Hui et al. ([**?**]). The planetary nebulae (PN) cover a range of galactocentric radius from 7.9 to 17.7′ (8 to 18Kpc). The spectra display typical emission lines of H I, He I, He II, [O III], [N II] and [S II] and appear very similar to high excitation planetary nebulae in the Galaxy. This implies that, from a stellar evolution viewpoint, there should be no peculiar effects introduced by considering the bright cut-off of the PN luminosity function for distance estimation. In particular the brightest PN detected in NGC 5128 is not spectroscopically unusual. One of the PN shows relatively strong He II and [N II] lines and the derived N/O ratio indicates that it may be a Type I nebula, considered to arise from a high mass progenitor star. Determinations of the oxygen abundance of the five PN shows a mean value 0.5 dex below solar. Given that NGC 5128 is an elliptical galaxy with a presumably metal rich stellar content, the low metallicities of the PN are unexpected, although a similar situation has been observed in the bulge of M 31.

Accepted by A&A

Preprints can be obtained by contacting jwalsh@eso.org *or via WWW on* http://xxx.lanl.gov/abs/astro-ph/9904281

Optical spectrum of the IR-source IRAS 23304+6147

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Using CCD spectra obtained with the echelle-spectrometer PFES of the 6 m telescope, we determined for the first time by the model atmospheres method the effective temperature $T_e = 5900$ K, surface gravity $\log g = 0.0$ and the detailed chemical composition for the faint star associated with the IR-source IRAS 23304 + 6147. The metallicity suggests that this star belongs to the old disk of the Galaxy (average content of iron group elements V, Cr, Fe for the object IRAS 23304+6147 is [X/H] = −0.61 dex). In the atmosphere of the IRAS 23304+6147

the increased abundances of carbon and nitrogen ([C/Fe] = +0.98, [N/Fe] = +1.36 and C/O > 1) are revealed. Essential excesses of lanthanoides have been revealed: the average value of [X/H] = +1.04 dex for La, Ce, Pr, Nd, Eu. The chemical abundances pattern in whole permits us to conclude that the chemical composition of the IRAS 23304+6147 atmosphere is mainly modified by nucleosynthesis and following dredge up.

By modelling of the spectrum of the object studied we revealed also absorptional features which are located at the wavelenghts of well known absorptional diffuse interstellar bands. The analysis of radial velocity and intensity of diffuse bands allows to conclude that these diffuse bands are formed mainly in the circumstellar dust envelope expanding with the velocity about of 20 km/sec. In the spectrum of the IRAS 23304+6147 were found also emission bands of Swan's system of the C_2 molecule which have been formed in circumstellar envelope.

The values of effective temperature of the object derived from the optical spectrum by the model atmospheres method and by modelling of spectral energy distribution in optical and infrared regions agree within accuracy of the methods.

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Reprints can be obtained by contacting valenta@sao.ru

The circumstellar molecular envelope of HD101584

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CO radio line observations reveal a molecular gas envelope around the peculiar star HD101584 with characteristics very similar to those of wellknown young post-AGB objects. We estimate that there is at least $0.1 M_{\odot}$ of molecular gas, very likely remnant gas from a former AGB-envelope. This gas has been efficiently accelerated to very high velocities ($>50\,\mathrm{km\,s^{-1}}$, and a significant fraction to $>100\,\mathrm{km\,s^{-1}}$). There is evidence for an expanding disk-like structure seen close to edge-on, and a high-velocity bipolar outflow. In the latter the expansion velocity increases linearly with distance from the star, suggesting either a brief period of ejection or a fast wind interacting with a slower wind. A significant fraction of the high-velocity gas has reached a welldefined terminal velocity. Momentum well above the available radiation momentum has been transferred to the gas. There are also indications of high-density, low-velocity molecular gas, possibly in a disk close to the star. The $^{12}CO/^{13}CO$-ratio in the envelope is uncertain, but probably quite low ($\sim$10). The systemic heliocentric velocity is $50\pm2\,\mathrm{km\,s^{-1}}$.

Accepted by A&A

Preprints can be obtained by contacting hans@astro.su.se *or via anonymous ftp on* ftp://hp5.astro.su.se/pub/preprints/hd101584.p

Oxygen-rich semiregular and irregular variables. A catalogue of circumstellar CO observations

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Using the SEST, the Onsala 20 m telescope, the JCMT, and the IRAM 30 m telescope we have carried out a survey of circumstellar CO(J=1–0, 2–1, 3–2, and 4–3) emission on a large sample of oxygen-rich semiregular (SRa and SRb) and irregular variables (Lb). A total of 109 stars were observed in at least one CO line: 66 were shown to have circumstellar CO line emission (7 SRa, 36 SRb, and 23 Lb variables), $\sim$ 60% of the semiregulars and all but one of the irregulars were detected for the first time. Most stars were observed in at least two

transitions. There is a total of 138 detected CO lines. For twelve stars strong interference from interstellar CO emission precluded detection.

We present here a catalogue of all observational data and the spectra of all detections, as well as brief discussions on detection statistics (including its dependence on variability type, period, IRAS-colour, IRAS LRS-class, and M-subclass), line profiles (including line shape asymmetry, multi-component line shapes, and line intensity ratios), gas expansion velocity distributions, and correlations between CO line and IR continuum fluxes (including implications for the mass-loss mechanism).

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Preprints can be obtained by contacting kerschbaum@astro.univie.ac.at *or via anonymous ftp on* ftp://hp5.astro.su.se/pub/preprir

Preliminary results on the circumstellar envelopes of α Ori and R Leo from CO 4.6 μm line emission

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CO 4.6 μm vibration-rotational lines are detected in fluorescent emission from the inner regions of the Betelgeuse (α Orionis) and R Leonis stellar winds. The spatially and spectrally resolved 1-0 R(1), R(2), and R(3) line profiles are found to be highly useful probes of circumstellar shells. The current data sample only a few regions of the circumstellar shells of the program stars. However, now it should be possible to obtain envelope maps and absolute flux estimates, allowing new independent estimates of mass loss rates. This will open up new possibilities in the study of the structure and dynamics of stellar winds around red giants. The temperature 4" away from α Ori is found to be 38^{+6}_{-5} K. For R Leo the temperature 4" North is derived to be 24^{+3}_{-2} K and 4" South 35^{+7}_{-4} K.

Accepted by A&A Letters

Preprints can be obtained by contacting nils.ryde@astro.uu.se

An Abundance Analysis of Two Carbon-Rich Proto-planetary Nebulae: IRAS Z02229+6208 and IRAS 07430+1115

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In this paper, we present an LTE abundance analysis of two new proto-planetary nebulae, IRAS Z02229+6208 and IRAS 07430+1115, based on high-resolution (R $\approx$ 55,000) optical echelle spectra. Results show that both stars are metal-poor ([Fe/H] = -0.5) and overabundant in C, N, and s-process elements. The average elemental abundances are [C/Fe] = +0.8, [N/Fe] = +1.2, and [s-process/Fe] = +1.4 for IRAS Z02229+6208, and [C/Fe] = +0.6, [N/Fe] = +0.4, and [s-process/Fe] = +1.6 for IRAS 07430+1115. These abundances suggest that the stars have experienced nucleosynthesis on the asymptotic giant branch (AGB), and the resultant products of

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CNO, 3α, and s-process reactions were brought to the photosphere during shell flashes and deep mixing episodes during the AGB phase of their evolution. Of major significance is the measurement of a high Li abundance in both stars, $\log \epsilon(\mathrm{Li}) \approx 2.3$ and 2.4 for IRAS Z02229+6208 and IRAS 07430+1115, respectively. This may be the result of hot bottom burning, below the deep convective zone.

We also present an analysis of the circumstellar molecular (C_2 and CN) and atomic (Na I and K I) absorption spectra of both stars. We derive rotational temperatures, column densities, and envelope expansion velocities using molecular C_2 Phillips and CN Red system bands. The values derived for expansion velocities, 8-14 km s^{-1}, are typical of the values found for post-AGB stars. IRAS 07430+1115 is unusual in that it shows P Cygni-shaped C_2 emission profiles in the spectra of the circumstellar envelope. A minimum distance for IRAS Z02229+6208, determined from interstellar Na I lines, suggests that it is evolved from an intermediate-mass star.

Including these two stars, the number of post-AGB stars for which clear C, N, and s-process elemental overabundances are found rises to eight. IRAS Z02229+6208 is known to possess the 21 μm emission feature in its mid-infrared spectrum; these results support the idea that all 21 μm emission stars are carbon-rich post-AGB stars.

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Preprints can be obtained by contacting ereddy@kepler.valpo.edu *or via anonymous ftp on*
ftp://kepler.valpo.edu/pub/preprints/abd_02229

The Discovery of Two New Bipolar Proto-Planetary Nebulae: IRAS 16594−4656 and IRAS 17245−3951

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We report the discovery of two new, bipolar proto-planetary nebulae (PPNs). Both are cool IRAS sources for which we have confirmed optical counterparts by our 10 μm observations. Ground-based visible and infrared photometry was combined with the IRAS photometry and spectroscopy to produce their spectral energy distributions (SEDs). These SEDs look like those of other PPNs, in particular those of bipolar PPNs. The central stars of both objects are highly reddened, and have color temperatures $\sim 3000 - 4000$ K. The nebulosities are dominated by scattered light, not emission lines as in planetary nebulae. IRAS 16594−4656 appears to possess the 21 μm emission feature seen previously in a dozen carbon-rich PPNs, along with the 8 μm PAH feature. Published millimeter-wave observations support the notion that it is carbon rich, while IRAS 17245−3951 appears to be oxygen rich. These facts confirm that these two objects are PPNs in transition between the AGB and PN phases.

HST imaging reveals that they are indeed bipolar nebulae. IRAS 17245−3951 clearly displays two lobes separated by a dust lane; thus it is viewed nearly edge on. Two jet-like features are seen in the southern lobe of IRAS 17245−3951, similar to the base of the searchlight beams seen in AFGL 2688. IRAS 16594−4656 appears to be a bipolar nebulae viewed at an intermediate orientation, and both the lobes and the central star can be seen. IRAS 16594−4656 therefore gives us our first clear example of the apparent morphology of a bipolar PPN viewed at an intermediate orientation. The addition of these objects to the list of bipolar PPNs confirms that such bipolar morphologies develop early in post-AGB evolution.

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Preprints can be obtained by contacting bruce.hrivnak@valpo.edu *or via anonymous ftp on*
ftp://kepler.valpo.edu/pub/preprints/HST_16594

Dust Shell of Carbon Star RW Leonis Minoris

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The results of our near-infrared photometry acquired over many years, the spectral energy distribution, and mid-infrared spectrum of carbon Mira variable RW LMi are fitted using the dust radiative transfer model for a spherically symmetric shell. The luminosity of the star is derived from a period-luminosity relation and found to be 9400 in solar units. The model assumes a single grain size. The radius of spherical grain is found to be equal to 0.10 micron. For the dust composition a combination of amorphous carbon and silicon carbide grains is assumed.

The derived model parameters are: effective temperature of the star, 2700 K; distance, 360 pc; inner shell radius in units of stellar radii, 5.0; temperature of the dust at the inner radius, 1300 K; ratio of silicon carbide to amorphous carbon dust, 0.03; optical dept of the dust shell at wavelength 11.3 micron, 0.58.

For the estimation of stellar wind parameters a self-consistent procedure of determination of mass-loss rate and expansion velocity is used. The derived parameters are: ratio of radiation pressure on a grain to gravitational pull, 3.9; drift velocity of the dust with respect to the gas, $4.1\,\mathrm{km\,s^{-1}}$; dust-to-gas mass ratio, 0.00203; dust mass-loss rate, $2.1 \times 10^{-8}\mathrm{M_\odot\,yr^{-1}}$; total mass-loss rate, $1.0 \times 10^{-5}\mathrm{M_\odot\,yr^{-1}}$.

The comparison of our results with the independent data for similar objects shows that RW LMi is a member of carbon Mira variables group with extremal mass-loss rate. Other parameters of the dust shell and the stellar wind are close to the mean values for these stars.

Accepted by Astronomy Reports

Preprints can be obtained by contacting taranova@sai.msu.ru

Announcements

Darwin and Astronomy: the Infrared Space Interferometer (IRSI) November 17 - 19, 1999, Stockholm, Sweden

Organisers: Swedish National Space Board (SNSB), European Space Agency (ESA) and Stockholm Observatory

Stockholm, Sweden, November 17 - 19, 1999

E-mail contact: darwin@astro.su.se

This is the first announcement for the conference 'Darwin and Astronomy - the Infrared Space Interferometer' to be held in Stockholm, Sweden, from November 17 to 19, 1999. The conference is organised by the Swedish National Space Board (SNSB) and the European Space Agency (ESA), with support by Stockholm Observatory.

All relevant documentation regarding the conference, including electronic forms for registration and hotel reservations, can be found on the web at

http://www.astro.su.se/~index.html

Purpose of this conference:
- to identify the most profound questions in the fields of modern astrophysics that can be adressed with a space-based interferometer working from 5 to 25 μm with baselines of up to 500 m and much more sensitive than ground-based instruments.

- to provide insights into the optimisation of the design of the instrument in the light of those questions.

It is envisaged that 30% of the time of the ESA candidate space mission for the Darwin infrared space interferometer will be devoted to general astrophysics. While much of the design will driven by its primary aim of extrasolar planetary systems studies, the astrophysical aims will also be important factors in the design.

This conference will start from a description of the present Darwin concept and its performance in different astrophysical observations. The inputs from participants in this conference will then constitute an important driving mechanism for the development of design characteristics of the instrument.

If you want to understand the prospects for space infrared interferometer astronomy or if you want to affect the design of Darwin so it can address your needs, you should attend this conference.

Topics and invited speakers include:
Galaxies and their Evolution Andrew Wilson (confirmed),
Active Galactic Nuclei/GC Reinhard Genzel (confirmed),
Observational Cosmology Malcolm Longair (tbc),
Supernovae (and Cosmology) Jason Spyromilio (tbc),
AGB and Related Phases of Stellar Evolution Hans Olofsson (confirmed),
Star Formation and Early Stellar Evolution Stephen Strom (confirmed),
Planet Formation and Disk Evolution Pawel Artymowicz (confirmed),
Physics of Planets Tristan Guillot (confirmed),
Planetology and Zodiacal Light Jane Luu (confirmed),
Astrobiology Baruch Blumberg (tbc),
Planets and Life Tobias Owen (tbc),
Origin of Life André Brack (confirmed),
Nulling Interferometry Neville Woolf and Bertrand Mennesson (confirmed),
Darwin - the Infrared Space Interferometer Malcolm Fridlund (confirmed),
TPF - the Terrestial Planet Finder Chas Beichman (confirmed),
GAIA - the Global Astrometric Interferometer for Astrophysics Lennart Lindegren (confirmed),
NGST - the Next Generation Space Telescope Peter Jakobsen (confirmed),
VLTI - the Very Large Telescope Interferometer Francesco Paresce (confirmed),
ALMA - the Atacama Large Millimeter Array Roy Booth (tbc)

Scientific Organising Committee: R. Genzel (chair), R. Liseau (co-chair), G. Arrhenius, C. Beichman, A. Brack, F. Capaccioni, C. Eiroa, M. Fridlund, T. Herbst, A. Léger, L. Nordh, A. Penny, D. Queloz, H. Roettgering, S. Volonte

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