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Abstracts of recently accepted papers

The ultraviolet variations of the post-AGB star HD 89353

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Based on the analysis of all low resolution spectra of HD 89353 (HR 4049) obtained with the International Ultraviolet Explorer (IUE) over several years and uniformly reprocessed, we report on large ultraviolet variations for this star whose amplitude increases towards long wavelengths. Ultraviolet maximum and minimum occur respectively at phase 0.52 and 0.92 of Waelkens et al (1991) ephemeris which suggests that ultraviolet and optical variations occur in phase. The ultraviolet energy distribution of HD 89353 is very deficient compared to that of the standard A6Ib star, HD 80404, and compared to the predictions of an ATLAS9 model (T_{eff} = 7500K, *logg* = 2.0 and $[\frac{M}{H}]$ = -5.0) which best fits the optical continuum. The ultraviolet flux deficiency scales as λ^{-1}, a trend already notes by Lamers et al (1986). The most likely interpretation is that variable circumstellar extinction drives the ultraviolet and optical variations as proposed by Waelkens et al (1991).

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Preprints can be obtained by contacting rmonier@newb6u-strasbg.fr

Dynamic model atmospheres of AGB stars I. Atmospheric structure and dynamics

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The strong interactions of shock waves caused by stellar pulsation, the formation of molecules and dust grains and a variable radiation field present a considerable challenge when modelling the atmospheres and circumstellar envelopes of pulsating asymptotic giant branch stars. In this paper we present dynamic model atmospheres of long-period variables which allow a consistent computation of near-infrared molecular features and their variability with phase. We discuss the effects of grey radiative transfer, of molecular opacities and of shock waves on the atmospheric structures and on the resulting wind properties. We find that the gas absorption coefficient used in the dynamical calculation has a considerable influence on the structure of the atmosphere, the mass loss and the observable spectral features. Therefore, we stress the importance of using reasonable mean gas opacities in grey dynamic models. Most topics discussed in this paper concern both C- and O-rich atmospheres but the quantitative results are mainly based on C-rich models. Synthetic spectra resulting from selected C- and O-rich models have been presented and compared to observations in several recent papers. A

systematic investigation of observable properties of our C-rich models will be the subject of a second paper in this series.

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Preprints can be obtained by contacting hoefner@astro.univie.ac.at

Observations of the 3.3 μm UIR band in the Red Rectangle: relation to unidentified optical emission

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The biconical Red Rectangle nebula exhibits very strong unidentified IR (UIR) emission bands, a subset of the optical diffuse interstellar bands (in emission), and extended red emission (ERE). A key question is the extent to which the carriers of these spectroscopic signatures may be related. In a new study of the 3.3 μm emission, CGS 4 spectra were recorded at UKIRT which give information on the spatial distribution of the 3.3 μm carrier in the nebula and on the width, peak wavelength and profile of the feature as a function of offset from the central star, HD 44179. Both Type 1 ($\lambda_0 \sim 3.289\mu$m, FWHM $\sim 0.042\,\mu$m) and Type 2 ($\lambda_0 \sim 3.296\,\mu$m, FWHM $\sim 0.020\,\mu$m) 3.3 μm features, as defined by Tokunaga et al. (1991), are found within the nebula. Type 2 is seen predominantly towards the central star, at the bicone interfaces and E and W of the star in the nebula. The broader Type 1 feature appears in the nebula 5" S of the central star, whereas the 3.3 μm band at 5" N appears to be a blend of Type 1 and Type 2. We find that there is no significant correlation between the intensity of the 3.3 μm feature and that of either the unidentified optical (diffuse) emission bands or ERE. This result suggests that there is at most an indirect link between the carrier(s) of the 3.3 μm band and this subset of diffuse bands. Such a link could arise, for example, if these diffuse band carriers were formed by chemical erosion or photo dissociation of PAH material.

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Preprints can be obtained by contacting psa@star.le.ac.uk
or via anonnymous ftp on ftp://brian.chem.nott.ac.uk/pub/3um/mnras3um.ps

The last gasps of VY CMa: Aperture synthesis and adaptive optics imagery

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We present new observations of the red supergiant VY CMa at 1.25 μm, 1.65 μm, 2.26 μm, 3.08 μm and 4.8 μm. Two complementary observational techniques were utilized: non-redundant aperture masking on the 10-m Keck-I telescope yielding images of the innermost regions at unprecedented resolution, and adaptive optics imaging on the ESO 3.6-m telescope at La Silla attaining extremely high ($\sim 10^5$) peak-to-noise dynamic range over a wide field. For the first time the inner dust shell has been resolved in the near-infrared to reveal a one-sided extension of circumstellar emission within $0.1''$ ($\sim 15\,R_\star$) of the star. The line-of-sight optical depths of the circumstellar dust shell at 1.65 μm, 2.26 μm, and 3.08 μm have been estimated to be 1.86±0.42, 0.85±0.20, and 0.44±0.11. These new results allow the bolometric luminosity of VY CMa to be estimated independent of the dust shell geometry, yielding $L_\star \approx 2\times10^5\,L_\odot$. A variety of dust condensations, including a large scattering

plume and a bow-shaped dust feature, were observed in the faint, extended nebula up to 4″ from the central source. While the origin of the nebulous plume remains uncertain, a geometrical model is developed assuming the plume is produced by radially-driven dust grains forming at a rotating flow insertion point with a rotational period between 1200-4200 years, which is perhaps the stellar rotational period or the orbital period of an unseen companion.

Accepted by Astrophysical Journal

Preprints can be obtained by contacting monnier@sunspot.ssl.berkeley.edu

Discovery of Two New, Carbon-Rich Proto-Planetary Nebulae: IRAS Z02229+6208 and IRAS 07430+1115

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We report the discovery of two new carbon-rich proto-planetary nebulae (PPNe), IRAS Z02229+6208 and 07430+1115. Optical spectroscopy of these sources and another previously-discovered PPN, IRAS 05431+0852, reveals the presence of C_2 and C_3 in absorption. All three objects have the spectra of G-K supergiants, consistent with the expectations of their being PPNe. New ground-based optical and infrared photometry, combined with the IRAS measurements, show double-peak spectral energy distributions for each; this suggests that the AGB mass loss has ended and these objects are in the post-AGB phase of evolution. The remnant of the molecular envelope is detected in CO emission for the first time in all three objects, using the CO (3-2) line. The 3.3 and 11.3 μm emission features commonly attributed to the PAH molecules have been detected in IRAS 07430+1115. Strikingly absent in IRAS 07430+1115, however, is the 21 μm emission feature, found in the other two and in all but one of the other PPNe known to show C_2 in absorption.

Accepted by ApJ

Preprints can be obtained by contacting contact-bhrivnak@exodus.valpo.edu
or via WWW on http://adress/directory.html
or via anonnymous ftp on ftp://kepler.valpo.edu/pub/hrivnak/2_crich

Sub-Arcsecond Optical Imaging of Proto-Planetary Nebulae

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Sub-arcsecond (0.75″) V and I images have been obtained of 13 new proto-planetary nebulae. We fine nine of them to be resolved, with sizes up to 3″, and two others to perhaps also be extended. Of the nine, four appear to be elliptical in shape. Thus an aspherical morphology is demonstrated to commonly exist early in the transition between the asymptotic giant branch and planetary nebula phases. The results of this larger observational study, together with the previously published imaging studies, indicate that most PPNe are elliptical (or bipolar) in shape.

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or via WWW on http://adress/directory.html
or via anonnymous ftp on ftp://kepler.valpo.edu/pub/hrivnak/imaging_cfht

Reprints

H.J. Habing published a long review on AGB stars in "The Astronomy and Astrophysics Review" (1996, vol.7, p97). Requests for a reprint are being received regularly. An electronic version in .ps format has now been restored and can be obtained via ftp following the well-known rules:

ftp strw.leidenuniv.nl
login: anonymous
password: your email address
cd /pub/habing
get aareview.ps.gz
bye

The file is gzipped. Therefore "gunzip" the manuscript before reading.
Be warned that the .ps file is some 52 Mbyte long.

A MEETING:

Asymmetrical Planetary Nebulae II: From Origins to Microstructures

3-6 August 1999; MIT, Cambridge, MA.

Aim: To discuss the physical processes that cause planetary nebulae (PN) to develop non spherical structure, and the relationship between such structure and PN evolution and chemistry. Topics will include: origins of PN asymmetries in single stars, binaries, planets, and/or circumstellar disks; main sequence vs. post-main sequence origins of PN asymmetries; microstructures (FLIERS; jets; etc); wind interactions and instabilities; ionization; molecular envelopes; interaction with the ISM; and other topics and systems related to asymmetrical planetary nebulae.

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or via WWW on http://space.mit.edu/PN_conf/