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Abstract of recently accepted papers

On Titanium Carbide Nanoparticles as the Origin of the 21 Micron Emission Feature in Post-Asymptotic Giant Branch Stars

Aigen Li

Theoretical Astrophysics Program, University of Arizona, Tucson, AZ 85721; agli@lpl.arizona.edu

Titanium carbide (TiC) nanocrystals were recently proposed as the carrier of the mysterious 21μm emission feature observed in post-asymptotic giant branch stars, based on their close spectral match and the presolar nature of meteoritic TiC nanograins (which reveals their stellar ejecta origin). But we show in this *Letter* that the Kramers-Kronig dispersion relations, which relate the wavelength-integrated extinction cross section to the total dust mass, would impose a lower bound on the TiC mass. This Kramers-Kronig lower limit exceeds the maximum available TiC mass by a factor of at least $\sim$50, independent of the absolute value of the (unkown) ultraviolet/visible absorptivity of nano TiC. The TiC model is therefore readily ruled out by the Kramers-Kronig physical principle.

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Indications of a Large Fraction of Spectroscopic Binaries Among Nuclei of Planetary Nebulae

O. De Marco[1], *H.E. Bond*[2], *D. Harmer*[3] *and A.J. Fleming*[4]

[1] Department of Astrophysics, American Museum of Natural History, Central Park West at 79th St., New York, NY 10024

[2] Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218

[3] Kitt Peak National Observatory, National Optical Astronomy Observatories, P.O. Box 26732, Tucson, AZ 85719

Department of Physics, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931

Previous work indicates that about 10% of planetary-nebula nuclei (PNNi) are photometrically variable short-period binaries with periods of hours to a few days. These systems have most likely descended from common-envelope (CE) interactions in initially much wider binaries. Population-synthesis studies suggest that these very close pairs could be the short-period tail of a much larger post-CE binary population with periods of up to a few months. We have initiated a radial-velocity (RV) survey of PNNi with the WIYN 3.5-m telescope and Hydra spectrograph, which is aimed at discovering these intermediate-period binaries. We present initial results showing that 10 out of 11 well-observed PNNi have variable RVs, suggesting that a significant binary population may be present. However, further observations are required because we have as yet been unable to

fit our sparse measurements with definite orbital periods, and because some of the RV variability might be due to variations in the stellar winds of some of our PNNi.

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or via WWW on http://research.amnh.org/users/orsola/Publications.html
or via anonymous ftp on ftp://astroftp.amnh.org/pub/orsola/offprints/cspn_rv_survey.pdf

Study of the Bipolar Nebula IRAS 19312+1950. I. Mapping Observations

Junichi Nakashima[1,2], *Shuji Deguchi*[1], *and Nario Kuno*[1]

[1] Nobeyama Observatory, National Astronomical Observatory, Minamimaki, Minamisaku, Nagano 384-1305, Japan

[2] Department of Astronomy, University of Illinois at Urbana-Champaign, 1002 W Green St., Urbana, Illinois 61801-3080, U. S. A.

IRAS 19312+1950 is the SiO maser source which exhibits a prominent bipolar nebulosity. Mapping observations of this object were made in the CO $J = 1$–0, ^{13}CO $J = 1$–0, C^{18}O $J = 1$–0, CS $J = 2$–1, and HCN $J = 1$–0 lines and in the 150 GHz continuum band. Near-infrared imaging observations were also made in the J, H and K-bands. The line profiles of the ^{12}CO and HCN spectra consist of a weak broad component with the line width of about 50 km s^{-1} and a strong narrow component of the width of about 3 km s^{-1}. The profiles of the ^{13}CO, C^{18}O, and CS lines have only the narrow component. Both of the components have an intensity peak at the IRAS position. The narrow component was clearly resolved with the 15″ telescope beam. The spectral energy distribution of this object exhibits a doubly peaked profile between 1 and 25 μm. The 150 GHz continuum flux density was found to be 0.07 Jy, which is consistent with the flux density predicted by the expanding envelope model with the mass loss rate of $\sim 10^{-4}$ M$_\odot$ y^{-1} at the distance of 2.5 kpc. We argue that the broad component originates from the expanding envelope of this object, and that the hot dust cloud, which is the source of the narrow component, is also physically associated with this object. Though the present observations do not preclude the possibility of a young stellar object, we argue that it is less plausible. We conclude that IRAS 19312+1950 is the AGB/post-AGB star which is evolved from a massive progenitor.

PASJ 56 No.1 (2004 Feb. 25 issue) in press
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Cool carbon stars in the halo: a new survey based on 2MASS

N. Mauron [1], *M. Azzopardi* [2], *K. Gigoyan* [3], *T.R. Kendall* [4]

[1] Groupe d'Astrophysique, UMR 5024 CNRS, Case CC72, Place Bataillon, F34095 Montpellier Cedex 5, France

[2] IAM, Observatoire de Marseille, 2 Place Le Verrier, F-13248 Marseille Cedex 4, France

[3]378433 Byurakan Astrophysical Observatory & Isaac Newton Institute of Chile, Armenian Branch, Ashtarak d-ct, Armenia

[4]Laboratoire d'Astrophysique, Observatoire de Grenoble, Université Joseph Fourier, BP 53, 38041 Grenoble Cedex 9, France

We present the first results of a new survey for finding cool N-type carbon (C) stars in the halo of the Galaxy. Candidates were first selected in the 2MASS Second Incremental Release database with JHK_s colours typical of red AGB C stars and $K_s < 13$, and subsequently checked through medium resolution slit spectroscopy. We discovered 27 new C stars *plus* one known previously and two similar objects in the Fornax and Sculptor dwarf galaxies. We determine and discuss the properties of our sample, including optical and near-infrared colours, radial velocities, as well as $H\alpha$ emission and variability that are frequent, all these characteristics being compatible with an AGB C-type classification. Surprisingly, of the 30 studied objects, 8 were found to have small but measurable proper motions (μ) in the USNO-B1.0 catalogue, ranging over $8 < \mu < 21$ mas yr^{-1} and

opening the possibility that some objects could perhaps be dwarf carbon stars. Yet, a detailed analysis based on comparison with the sample of known carbon dwarfs leads us to consider these μ as incompatible with the broader picture suggested by the other data taken as a whole. So, we adopt the view that all objects are of AGB type, i.e. luminous and distant. Because the stream of Sagittarius dwarf galaxy is known to be the dominant source of luminous C stars in the halo, we chose to determine distances for our sample by scaling them on the 26 known AGB C stars of the Sgr galaxy itself, which are found to be, in the K_s-band, ~ 0.5 mag. less luminous than the average LMC C stars for a given $J - K_s$ colour. The obtained distances of our halo stars range from 8 to 80 kpc from the Sun. Then, examination of position and radial velocities show that about half belong to the Sgr stream. Our findings suggest that numerous AGB C stars remain to be discovered in the halo. Long term K_s-band monitoring would be of great value to ascertain distance estimates through the period-luminosity relation, because a large fraction of our sample is probably made of Mira variables.

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or via anonymous ftp on saphir.dstu.univ-montp2.fr in pub/GRAAL/mauron

The abundance distributions of Galactic bulge and disc planetary nebulae

K.M. Exter[1], *M. J. Barlow*[2], *N. A. Walton*[3]

[1] current address: IAC, c/ Via Lactea, E38200 La Laguna (Tenerife), Spain

[2] Department of Physics & Astronomy, University College London, Gower St., London, UK

[3] Institute of Astronomy, University of Cambridge, Madingly Rd, Cambridge, UK

We present an abundance analysis of a sample of Galactic bulge planetary nebulae (GBPNe). The observational dataset consists of spectra of 88 nebulae obtained with the FLAIR II multi-object spectrograph on the U.K. Schmidt Telescope, together with spectra of 42 nebulae obtained with the RGO Spectrograph on the Anglo-Australian Telescope. After selecting those for which reliable nebular electron temperatures could be derived, collisionally excited line abundances were derived for 45 GBPNe.

These were then compared to similarly derived abundances for 54 Galactic disc PNe (GDPNe), taken from Kingsburgh & Barlow. We find that within the errors the abundances have the same average values, essentially the same distributions – including that for the mass-sensitive N/O ratio – and show the same relationships. The width of the nitrogen distribution exceeds that due to errors, which could be a consequence of the range of precursor masses. The ratio of Type I to non-Type I PNe in the bulge and disc samples is similar, 18 and 25 per cent respectively. For the GDPNe, we find larger N/H and N/O ratios for the *small* number of those with He/H>0.14, compared to those with He/H<0.14.

For neither disc nor bulge sample is there any strong evidence for a depletion of oxygen for the higher-mass precursor stars (Type I PNe). We find no correlation between O/H and N/O or He/H. On the N/O to He/H plane, the bulge and disc PNe show a distribution whereby the low N/O values only occur for low He/H values, but at N/O> 0.25 the whole range of He/H values were sampled. The theoretical tracks we compare our data to do not explain the PNe with low He/H abundance and high N/O ratio.

Realistic uncertainties in collisionally excited line abundances for individual PNe are quite large, of the order 40 per cent for oxygen. Large samples are therefore required to get good statistical accuracy. This is usually achieved by combining many studies, and so we have compared the results of a number of published studies with our own, to search for any systematic differences. The average abundances are found to be the same within the errors except for where the abundance derivation methods are dissimilar, where systematic differences can occur. The N/O ratio is especially sensitive to the details of the abundance derivations.

Our bulge PN sample shows no evidence for either very low metallicity objects or for super metal rich objects – the implied mass and age distributions of the bulge PN precursor stars are indistinguishable within the observational errors from those in the local Galactic disc.

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Preprints can be obtained from Katrina Exter contacting katrina@ll.iac.es

The Evolution of Planetary Nebulae. I. A radiation-hydrodynamics parameter study

M. Perinotto[1], *D. Schönberner*[2], *M. Steffen*[2], *and C. Calonaci*[3]

[1] Dipartimento di Astronomia e Scienza dello Spazio, Largo E. Fermi 2, 50125 Firenze, Italy (Email: mariop@arcetri.astro.it)

[2] Astrophysikalisches Institut Potsdam, An der Sternwarte 16, D-14482 Potsdam, Germany (Email: deschoenberner@aip.de, msteffen@aip.de)

[3] CINECA Interuniversity Consortium, via Magnanelli 6/3, 40033 Casalecchio di Reno (BO), Italy (Email: c.calonaci@cineca.it)

We follow hydrodynamically the evolution of spherical model planetary nebulae subject to different initial conditions and with various central stars, investigating how combinations of central-star mass and asymptotic giant branch mass-loss rate determine the shape and kinematics of a planetary nebula. With this approach we aim at constituting a framework useful for the interpretation of the evolutionary status and previous mass-loss history of observed individual nebulae, making use of their kinematical properties and surface brightness characteristics. In particular, the models are compared with the observed morphologies and kinematics of double shell nebulae. The dynamical structure of all the models is characterized by a more or less complicated shock wave pattern set up by ionization and wind interaction whose combined action results in general in a typical double-shell structure. We have found that models with simple initial structures based on a constant AGB mass-loss rate fail to comply with observed shell morphologies and surface-brightness distributions. A reasonable agreement with the observations is only found for a model where the mass-loss rate is strongly increasing towards the end of the asymptotic giant-branch evolution. Depending on the central star's evolutionary speed and the density of the cool wind expelled along the asymptotic giant-branch, planetary nebulae may never get optically thin. This is primarily the case for the more massive central stars, and this fact offers a rather natural explanation for the long standing problem of the very existence of molecular hydrogen in the immediate vicinity of hot central stars. We also show that distances to planetary nebulae based on expansion parallaxes are systematically too small by a significant amount.

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Preprints can be obtained by contacting msteffen@aip.de *or via WWW on*
http://www.aip.de/groups/sternphysik/stp/publications_neu.html

Low-mass supernovae in the early Galactic halo: source of the double r/s-process enriched halo stars?

Albert Zijlstra

UMIST, Department of Physics, P.O. Box 88, Manchester M60 1QD, UK

Several stars at the low-metallicity extreme of the Galactic halo ([Fe/H] $= -2.5$) show strong enhancements of both s-process and r-process elements. The presence of s-process elements in main-sequence stars is explained via mass transfer from an AGB companion star in a binary system. r-Process elements originate in type-II supernovae and also require mass transfer. It is however unclear how pollution by both an AGB star and a supernova could have occured. Here I show that the initial–final-mass relation steepens at low metallicity, due to low mass-loss efficiency. This may cause the degenerate cores of low-Z, high-mass AGB stars to reach the Chandresekhar mass, leading to an Iben & Renzini-type-1.5 supernova. Such supernovae can explain both the enhancement patterns and the metallicity dependence of the double-enhanced halo stars. Reduced mass loss efficiency predicts more massive remnants in metal-poor globular clusters. The evidence for a high M/L population in the cores of globular clusters is briefly discussed.

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Preprints can be obtained via WWW on
http://iapetus.phy.umist.ac.uk/MNRASXXX/MNRASXXX.html

Rings in the haloes of planetary nebulae

R.L.M. Corradi[1], P. Sánchez-Blázquez[2], G. Mellema[3], C. Gianmanco[4], and H.E. Schwarz[5]

[1] Isaac Newton Group of Telescopes, Ap. de Correos 321, 38700 Sta. Cruz de la Palma, Spain

[2] Departamento de Astrofísica, Universidad Complutense, 28040, Madrid, Spain

[3] Sterrewacht Leiden, Postbus 9513, 2300 RA Leiden, The Netherlands

[4] Instituto de Astrofísica de Canarias, 38200 La Laguna, Tenerife, Spain

[5] Cerro Tololo Inter-American Observatory, NOAO-AURA, Casilla 603, La Serena, Chile

We present a search for rings or arcs in the haloes of planetary nebulae (PNe). We discovered such structures in eight PNe, tripling the sample of PNe with known rings. This shows that, contrary to what was believed to date, the occurrence of mass loss fluctuations with timescales of 10^2–10^3 yrs at the end of the asymptotic giant branch phase (AGB) is common. We estimate a lower limit of the occurrence rate of rings in PN haloes to be $\sim$35%.

Using these new detections and the cases previously known, we discuss the statistical properties of ring systems in PNe haloes. We estimate that the mass modulation producing the rings takes place during the last 10000 or 20000 yrs of AGB evolution. In PNe, the spacing between rings ranges from <0.01 pc to 0.06 pc, significantly larger than those seen in proto-PNe. This, together with the finding of a possible positive correlation of spacing with the post-AGB age of the nebulae, suggests that the spacing of the rings increases with time.

These properties, as well as the modest surface brightness amplitudes of rings, are consistent with the predictions of the dust-driven wind instability model explored by Meijerink et al. (2003), but do not immediately exclude other proposed models.

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Preprints can be obtained by contacting rcorradi@ing.iac.es or via WWW on http://www.ing.iac.es/∼rcorradi/

Magneto-Hydrodynamic Models of the Bipolar Knotty Jet in Hen 2-90

C.-F. Lee and R. Sahai

Jet Propulsion Laboratory, MS 183-900, 4800 Oak Grove Drive, Pasadena, CA 91109

A remarkably linear, bipolar, knotty jet was recently discovered in Hen 2-90, an object classified as a young planetary nebula. Using two-dimensional magneto-hydrodynamical simulations, we investigate periodic variations in jet density and velocity as the mechanism for producing the jet and its knotty structures. From a detailed comparison between the Hα emission derived from our models and the observations, we find that a non-magnetized jet with density or velocity variations does not reproduce in detail the observed structure of the Hen 2-90 jet – a magnetized jet with periodic velocity variations is required. This jet has a radius of 125 AU, an average velocity of 300 km s^{-1}, with periodic variations (period=43 years) in the jet velocity of amplitude $\pm$15 km s^{-1}, and a toroidal magnetic field with a characteristic strength of 0.6 mG. The average mass-loss rate in the jet has decreased by about a factor 3 in 600 yrs (i.e. from 4.7×10^{-7} M$_\odot$yr^{-1} at 20$''$ to 1.7×10^{-7} M$_\odot$yr^{-1} at 1$''$ from the center along the jet axis). The progenitor AGB wind is assumed to have a mass-loss rate of 1.5×10^{-6} M$_\odot$yr^{-1} (derived from the round, tenuous, Hα halo surrounding the central source) and a typical expansion velocity of 10 km s^{-1}. We find a fairly detailed similarity in the physical properties of the jet in Hen 2-90 with that in the young stellar object HH 34. This similarity suggests that the jets in both objects may be launched in a similar manner, namely, from an accretion disk, despite the fact that these objects are at very different evolutionary stages.

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Preprints can be obtained by contacting Chin-Fei at cflee@cfa.harvard.edu

The Mid-IR Emission Structure of IRAS 16594-4656

D. A. García-Hernández[1], *A. Manchado*[1,2], *P. García-Lario*[3], *A. Benítez Cañete*[4], *J. A. Acosta-Pulido*[1], *Ana M. Pérez García*[1]

[1] Instituto de Astrofísica de Canarias, E-38205 La Laguna, Tenerife, Spain

[2] Consejo Superior de Investigaciones Científicas, CSIC

[3] ISO Data Centre, Science Operations and Data Systems Division, Research and Scientific Support Department of ESA, VILSPA, 28080 Madrid, Spain

[4] Astrophysics Department, La Laguna University, 38205 La Laguna, Tenerife, Spain

We report TIMMI2 diffraction-limited mid-IR images of the multipolar PPN IRAS 16594-4656. By using the Lucy-Richardson deconvolution algorithm we recover a two-peaked morphology in the innermost region at 8.6 and 11.5 μm. We interpret the observed mid-IR structure as the detection of the two limb-brightened peaks indicating the presence of a dusty toroidal structure in IRAS 16594-4656. We find that the supposed biconical openings of the dust torus are in good agreement with one of the bipolar outflows identified in the HST optical images.

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Preprints can be obtained via WWW on http://arxiv.org/abs/astro-ph/0402064

W Hya : molecular inventory by ISO-SWS

K. Justtanont[1], *T. de Jong*[2,3], *A.G.G.M. Tielens*[4,5], *H. Feuchtgruber*[6], *and L.B.F.M. Waters*[3]

[1] Stockholm Observatory, AlbaNova, Dept. of Astronomy, SE-106 91 Stockholm, Sweden

[2] SRON-Utrecht, Sorbonnelaan 2, NL-3584 CA Utrecht, The Netherlands

[3] University of Amsterdam, Kruislaan 403, NL-1098 SJ Amsterdam, The Netherlands

[4] Kapteyn Institute, P.O. Box 800, NL-9700 AV Groningen, The Netherlands [5] SRON-Groningen, P.O. Box 800, NL-9700 AV Groningen, The Netherlands [6] Max-Planck Institut fuer extraterrestrische Physik, Giessenbachstrasse, D-85740 Garching, Germany

Infrared spectroscopy is a powerful tool to probe the inventory of solid state and molecular species in circumstellar ejecta. Here we analyse the infrared spectrum of the Asymptotic Giant Branch star W Hya, obtained by the Short and Long Wavelength Spectrometers on board of the Infrared Satellite Observatory. These spectra show evidence for the presence of amorphous silicates, aluminum oxide, and magnesium-iron oxide grains. We have modelled the spectral energy distribution using laboratory measured optical properties of these compounds and derive a total dust mass loss rate of 3×10^{-10} $M_\odot$ yr^{-1}. We find no satisfactory fit to the 13μm dust emission feature and the identification of its carrier is still an open issue.

We have also modelled the molecular absorption bands due to H_2O, OH, CO, CO_2, SiO, and SO_2 and estimated the excitation temperatures for different bands which range from 300 to 3 000K. It is clear that different molecules giving rise to these absorption bands originate from different gas layers. We present and analyse high resolution Fabry-Perot spectra of the three CO_2 bands in the 15μm region. In these data, the bands are resolved into individual Q-lines in emission, which allows the direct determination of the excitation temperature and column density of the emitting gas. This reveals the presence of a warm ($\simeq$ 450K) extended layer of CO_2, somewhere between the photosphere and the dust formation zone. The gas in this layer is cooler than the 1 000K CO_2 gas responsible for the low-resolution absorption bands at 4.25 and 15μm. The rotational and vibrational excitation temperatures derived from the individual Q-branch lines of CO_2 are different ($\sim$ 450K and 150K, respectively) so that the CO_2 level population is not in LTE.

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Preprints can be obtained by contacting kay@astro.su.se

or via WWW on www.arxiv.org/archive/astro-ph/0402068

High-resolution imaging of dust shells using Keck aperture masking and the IOTA Interferometer

J. D. Monnier[1], *R. Millan-Gabet*[2], *P. G. Tuthill*[3], *W. A. Traub*[4], *N. P. Carleton*[4], *V. Coudé du Foresto*[5], *W. C. Danchi*[6], *M. G. Lacasse*[4], *S. Morel*[7], *G. Perrin*[5], *I. L. Porro*[8], *F. P. Schloerb*[9], *and C. H. Townes*[10]

[1] University of Michigan Astronomy Department

[2] Michelson Science Center, California Institute of Technology

[3] University of Sydney, Physics Department

[4] Harvard-Smithsonian Center for Astrophysics

[5] Observatoire de Paris-Meudon

[6] NASA Goddard Space Flight Center

[7] European Southern Observatory

[8] Massachusetts Institute of Technology

[9] University of Massachusetts, Amherst

[10] University of California, Berkeley

We present first results of an experiment to combine data from Keck aperture masking and the Infrared-Optical Telescope Array (IOTA) to image the circumstellar environments of evolved stars with ≈20 milliarcsecond resolution. The unique combination of excellent Fourier coverage at short baselines and high-quality long-baseline fringe data allows us to determine the location and clumpiness of the inner-most hot dust in the envelopes, and to measure the diameters of the underlying stars themselves. We find evidence for large-scale inhomogeneities in some dust shells and also significant deviations from uniform brightness for the photospheres of the most evolved M-stars. Deviations from spherically-symmetric mass loss in the red supergiant NML Cyg could be related to recent evidence for dynamically-important magnetic fields and/or stellar rotation. We point out that dust shell asymmetries, like those observed here, can qualitatively explain the difficulty recent workers have had in simultaneously fitting the broad-band spectral energy distributions and high-resolution spatial information, without invoking unusual dust properties or multiple distinct shells (from hypothetical "superwinds"). This paper is the first to combine optical interferometry data from multiple facilities for imaging, and we discuss the challenges and potential for the future of this method, given current calibration and software limitations.

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Preprints can be obtained by contacting monnier@umich.edu or via WWW on
http://www.astro.lsa.umich.edu/ monnier/Publications/keckiota2004.pdf

Interferometric observations of the supergiant stars α Orionis and α Herculis with FLUOR at IOTA

G. Perrin [1], *S.T. Ridgway* [2], *V. Coudé du Foresto* [1], *B. Mennesson* [3], *W.A. Traub* [4] *and M.G. Lacasse* [4]

[1] Observatoire de Paris, LESIA, UMR 8109, F-92190 Meudon, France

[2] National Optical Astronomy Observatories, Tucson, AZ 85726-6732, USA

[3] Jet Propulsion Laboratory, California Insititute of Technology, MS 306-388, 4800 Oak Grove Drive, Pasadena, CA 91109, USA

[4] Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, USA

We report the observations in the K band of the red supergiant star α Orionis and of the bright giant star α Herculis with the FLUOR beamcombiner at the IOTA interferometer. The high quality of the data allows us to estimate limb-darkening and derive precise diameters in the K band which combined with bolometric fluxes yield effective temperatures. In the case of Betelgeuse, data collected at high spatial frequency although sparse are compatible with circular symmetry and there is no clear evidence for departure from circular symmetry. We have combined the K band data with interferometric measurements in the L band and at 11.15 μm. The full set of data can be explained if a 2055 K layer with optical depths $\tau_K = 0.060 \pm 0.003$, $\tau_L = 0.026 \pm 0.002$ and $\tau_{11.15\mu m} = 2.33 \pm 0.23$ is added $0.33\,R_\star$ above the photosphere providing a first consistent view of the star in this range of wavelengths. This layer provides a consistent explanation for at least three otherwise puzzling

observations: the wavelength variation of apparent diameter, the dramatic difference in limb darkening between the two supergiant stars, and the previously noted reduced effective temperature of supergiants with respect to giants of the same spectral type. Each of these may be simply understood as an artifact due to not accounting for the presence of the upper layer in the data analysis. This consistent picture can be considered strong support for the presence of a sphere of warm water vapor, proposed by Tsuji(2000) when interpreting the spectra of strong molecular lines.

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Preprints can be obtained by contacting guy.perrin@obspm.fr
or via WWW on http://arxiv.org/abs/astro-ph/0402099

On expansion parallax distances for planetary nebulae

Garrelt Mellema

ASTRON, P.O.Box 2, NL-7990 AA Dwingeloo, The Netherlands

The distances to individual wind-driven bubbles such as Planetary Nebulae (PNe) can be determined using expansion parallaxes: the angular expansion velocity in the sky is compared to the radial velocity of gas measured spectroscopically. Since the one is a pattern velocity, and the other a matter velocity, these are not necessarily the same. Using the jump conditions for both shocks and ionization fronts, I show that for typical PNe the pattern velocity is 20 to 30% larger than the material velocity, and the derived distances are therefore typically 20 to 30% too low. I present some corrected distances and suggest approaches to be used when deriving distances using expansion parallaxes.

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Preprints can be obtained by contacting gmellema@astron.nl
or via WWW on http://www.arxiv.org/abs/astro-ph/0312140

Water masers in dusty environments

N. Babkovskaia and J. Poutanen

Astronomy Division, P.O.Box 3000, FIN-90014 University of Oulu, Finland

We study in detail a pumping mechanism for the $\lambda = 1.35$ cm maser transition $6_{16} \rightarrow 5_{23}$ in ortho-water based on the difference between gas and dust temperatures. The upper maser level is populated radiatively through $4_{14} \rightarrow 5_{05}$ and $5_{05} \rightarrow 6_{16}$ transitions. The heat sink is realized by absorbing the 45 μm photons, corresponding to the $5_{23} \rightarrow 4_{14}$ transition, by cold dust. We compute the inversion of maser level populations in the optically thick medium as a function of the hydrogen concentration, the gas-to-dust mass ratio, and the difference between the gas and the dust temperatures. The main results of the numerical simulations are interpreted in terms of a simplified four-level model. We show that the maser strength depends mostly on the product of hydrogen concentration and the dust-to-water mass ratio but not on the size distribution of the dust particles or their type. We also suggest approximate formulae that describe accurately the inversion and can be used for fast calculations of the maser luminosity. Depending on the gas temperature, the maximum maser luminosity is reached when the water concentration $N_{\rm H_2O} \approx 10^6$–$10^7 {\rm cm}^{-3}$ times the dust-to-hydrogen mass ratio, and the inversion completely disappears at densities just an order of magnitude larger. For a dust temperature of 130 K, the $6_{16} \rightarrow 5_{23}$ transition becomes inverted already at a temperature difference of $\Delta T \sim 1$ K, while other possible masing transitions require a larger $\Delta T > 30$ K. We identify the region of the parameter space where other ortho- and para-water masing transitions can appear.

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Preprints can be obtained by contacting juri.poutanen@oulu.fi or via WWW on http://xxx.lanl.gov/abs/astro-ph/0401210

A study of the s-process in the carbon-rich post-AGB stars IRAS 06530-0213 and IRAS 08143-4406 on the basis of VLT-UVES spectra

M. Reyniers[1], *H. Van Winckel*[1], *R. Gallino*[2,3], *O. Straniero*[4]

[1] Instituut voor Sterrenkunde, Departement Natuurkunde en Sterrenkunde, K.U.Leuven, Celestijnenlaan 200B, 3001 Leuven, Belgium

[2] Dipartimento di Fisica Generale, Universitá di Torino, Via Pietro Giuria 1, 10125 Torino, Italy

[3] Centre for Stellar and Planetary Astrophysics, School of Mathematical Sciences, Monash University, 3800 Australia

[4] Osservatorio Astronomico di Collurania, 64100 Teramo, Italy

In an effort to extend the still limited sample of s-process enriched post-AGB stars, high-resolution, high signal-to-noise VLT+UVES spectra of the optical counterparts of the infrared sources IRAS 06530-0213 and IRAS 08143-4406 were analysed. The objects are moderately metal deficient by [Fe/H] $= -0.5$ and -0.4 respectively, carbon-rich and, above all, heavily s-process enhanced with a [ls/Fe] of 1.8 and 1.5 respectively. Especially the spectrum of IRAS 06530-0213 is dominated by transitions of s-process species, and therefore resembling the spectrum of IRAS 05341+0852, the most s-process enriched object known so far. The two objects are chemically very similar to the 21μm objects discussed in Van Winckel & Reyniers (2000). A homogeneous comparison with the results of these objects reveals that the relation between the third dredge-up efficiency and the neutron nucleosynthesis efficiency found for the 21μm objects, is further strengthened. On the other hand, a detailed comparison with the predictions of the latest AGB models indicates that the observed spread in nucleosynthesis efficiency is certainly intrinsic, and proves that different ^{13}C pockets are needed for stars with comparable mass and metallicity to explain their abundances.

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PAHs and crystalline silicates in the post-AGB star IRAS 16279−4757

M. Matsuura[1], *A.A. Zijlstra*[1], *F.J. Molster*[2], *S. Hony*[2], *L.B.F.M. Waters*[3,4], *F. Kemper*[5], *J.E. Bowey*[6], *H. Chihara*[7,8], *C. Koike*[7], *L.P. Keller*[9]

[1] Department of Physics, UMIST, P.O. Box 88, Manchester M60 1QD, UK

[2] ESTEC/ESA, PO Box 299, 2200 AG Noordwijk, The Netherlands

[3] Astronomical Institute 'Anton Pannekoek', University of Amsterdam, Kruislaan 403, 1098 SJ, Amsterdam, The Netherlands

[4] Instituut voor Sterrenkunde, Katholieke Universiteit Leuven, Celestijnenlaan 200B, 3001 Heverlee, Belgium

[5] Department of Physics and Astronomy, University of California, Los Angeles, CA 90095-1562, USA

[6] Department of Physics and Astronomy, University College London, Gower Street, London WC1E 6BT, UK

[7] Kyoto Pharmaceutical University, Yamashina, Kyoto 607-8412, Japan

[8] Department of Earth and Space Science, Osaka University, Toyonaka, Osaka 560-0043, Japan

[9] Mail Code SR, NASA Johnson Space Center, Houston, Texas 77058, USA

IRAS 16279−4757 belongs to a group of post-AGB stars showing both PAH bands and crystalline silicates. We present mid-infrared images, that resolve the object for the first time. The morphology is similar to that of the 'Red Rectangle' (HD 44179), the prototype object with PAHs and crystalline silicates. A two-component model and images suggest a dense oxygen-rich torus, an inner, low-density carbon-rich region and a carbon-rich bipolar outflow. The PAH bands are enhanced at the outflow, while the continuum emission is concentrated towards the center. Our findings support the suggestion that mixed chemistry and morphology are closely related. We discuss the ISO/SWS spectra of IRAS 16279−4757. Several bands in the ISO/SWS spectrum show a match with anorthite: this would be the first detection of this mineral outside the solar system. Compared

to HD 44179, the shapes of PAH bands are closer to those of planetary nebulae, possibly related to a population of small PAHs present HD 44179, but absent around IRAS 16279−4757. Detailed examination of the spectra shows the individual character of these two objects. The comparison suggests that the torus found in IRAS 16279−4757 may have formed more recently than that in HD 44179.

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Dissertation abstract

On the analysis of the IR spectra of cool giants: model atmospheres and time-dependent behaviour

R. Van Malderen

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Ph.D dissertation directed by: Prof. dr. Christoffel Waelkens

Ph.D degree awarded: November 2003

Current address: Institute of Astronomy, Catholic University of Leuven, Celestijnenlaan 200 B, 3001 LEUVEN, Belgium

Electronic mail: roeland@ster.kuleuven.ac.be

We investigated the Short Wavelength Spectrometer (ISO-SWS) spectra of mostly cool giants. We confronted these observed spectra with synthetic spectra generated from MARCS model atmospheres. For cool, *static* giants, this comparison enabled us to detect some remaining instrumental artifacts in the $12 - 27\,\mu$m spectra, like residual fringes and baseline ripples. We also noted that the description of the structure variables in the outer layers of the model atmospheres is not completely consistent with the observations. A possible explanation is given by small-scale dynamical phenomena in the atmospheres of these stars.

In the case of *dynamical* cool giants – the pulsating AGB stars – a hydrostatic description for their highly extended atmospheres is not adequate. In a first step within our study of the time behaviour of the eight $2.38 - 27\,\mu$m SWS spectra of the O-rich AGB star T Cep, we nevertheless used hydrostatic MARCS model atmospheres to separate the photospheric contribution from the circumstellar component in the spectra. Then, we mimicked the 'extended atmosphere' by putting a thermal water slab in front of the hydrostatic model atmosphere. Subsequently, this latter adopted model configuration was used to subtract dust emission spectra from the observations. Within this approach, we found that the effective temperature of T Cep varies in lock step with the visual lightcurve, while the stellar radius shows a phase lag with regard to the visual lightcurve. We also established that the density and luminosity variation of the region traced by the water layer drive the variation of most molecular features in the spectra of T Cep. Shocks are likely to have occurred during the observed time interval.

The circumstellar dust shell around T Cep consists of small, hot dust particles of amorphous silicates, amorphous alumina, and MgFeO. Furthermore, a $13\,\mu$m feature arises, for which we confirm the doubts about the identification of its carrier to be spinel. The variation of the dust shell is not luminosity-driven, but is linked to the stellar temperature variation or to dust condensation/evaporation. Finally, we found indications of a varying composition of alumina during the observed time interval.

Announcements

ALMA Science Workshop

University of Maryland Conference Center May 14-15, 2004

In October 1999, a meeting was held in Washington, D. C. to bring together scientists working on the development of what would become ALMA to review the scientific program planned for the array and how that program interacted with the science goals of other astronomical facilities contemporaneous with it. The results of that meeting were published in *Science with ALMA*, ASP Conference Series Volume 235. Much of the research planned for ALMA at that meeting has appeared in the ALMA Design Reference Science Plan, a collection of experiments planned for the fully operational ALMA which was recently presented by the ALMA Project and which may be inspected at www.alma.nrao.edu.

Construction of ALMA has begun, and planning for its operation continues. The North American ALMA Science Center, under construction in Charlottesville, will be the center of interaction between the telescope and the American user. The 14-15 May 2004 workshop at the University of Maryland will focus on ALMA science and on this interaction between ALMA and the user. Early Science is expected from a subset of ALMA telescopes by 2008. Astronomers are invited to discuss the present state of plans for ALMA, ALMA's scientific goals and how best to enable them, what science goals might be accomplished during the ALMA Early Science Phase and the face ALMA presents to its scientists users. For further details please visit the ALMA web site at www.alma.nrao.edu

Stars and Nuclei : A tribute to MANUEL FORESTINI

Grenoble (France), March 4-5, 2004

Manuel Forestini, a young professor at Universite Joseph-Fourier, passed away suddenly from a heart attack at age 40, almost a year ago. As a tribute to his memory as a professor and astrophysicist, the Laboratoire d'Astrophysique de Grenoble (LAOG), where he was working, is organizing an international workshop on the topics to which Manuel dedicated a life of hard work and creativity: Stars and Nuclei.
The LAOG conference room will be dedicated to him on this occasion, in the presence of officials from Universite Joseph-Fourier.
A number of Manuel's colleagues and collaborators will give invited talks. Contributed oral papers are welcome, in the fields in which Manuel worked (stellar structure and evolution, nucleosynthesis), and more generally in stellar physics.

Deadline for registration and contributions : March 1st, 2004
There are no registration fees. A buffet lunch will be offered by LAOG on both days of the meeting.

Deadline for hotel registration: no fixed deadline, except that late reservations will be more difficult to satisfy, especially downtown. So it is recommended to book early. Information can be found on the LAOG web page: http://www-laog.obs.ujf-grenoble.fr/
Registration and hotel reservations can be made by contacting Sandrine Vignon: <sandrine.vignon@obs.ujf-grenoble.fr>

Organizing Committee : Marcel Arnould (Brussels), Claude Bertout (Paris), Corinne Charbonnel (Geneva), Michel Guelin (Grenoble), Claudine Kahane (Grenoble), Agnes Lebre (Montpellier), Andre Maeder (Geneva), Thierry Montmerle (Grenoble, Chair), Christian Perrier (Grenoble), Lionel Siess (Brussels).

Invited Speakers (as of 26/1/04): M. Arnould, C. Kahane, C. Charbonnel, L. Siess, M. Guelin*; G. Jasniewicz* (Montpellier), G. Leclair (Grenoble), M. El Eid (Beirut), J. Lattanzio (Monash and Cambridge, UK), C. Tout* (Cambridge, UK), N. Prantzos (Paris), B. Plez (Montpellier), F. Thevenin* (Nice)

* to be confirmed