OBSERVATIONS OF THE 30 μm FEATURE IN IRC + 10216

T. Herter, D.A. Briotta, Jr., G.E. Gull, J.R. Houck
Center for Radiophysics & Space Research, Cornell University, Ithaca, NY 14853, USA

New observations of the unidentified 30 μm spectral feature found in two planetary nebulae and four carbon stars are reported. The carbon star IRC + 10216 was observed from the Kuiper Airborne Observatory over the range 30 to 37 μm. These new data confirm the existence of the feature and determine its shape beyond 30 μm. The determination of the long wavelength end of the spectral excess depends critically on the assumed underlying continuum. A combined spectrum of the excess is presented and shows the feature to extend at least to 37 μm.

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OH/IR STARS: DARK PLANETARY NEBULAE?

J. Herman
Sterrewacht, Huygens Laboratorium, Leiden

The OH maser emission from OH/IR stars (type IIb) originates from the thick circumstellar dust shell. As the envelope is expanding and the strongest maser emission comes from the front- and the backside, where the gain pathlength is longest, we can measure a definite phaselag (and hence a diameter) between front- and backside of the shell for all sources that are variable.

A monitor program for 60 OH masers with the Dwingeloo Radio Telescope shows that most OH/IR stars are variable, with periods up to 2000 days. They appear to be extreme members of the Mira variables, the precursors of planetary nebulae. The monitor program reveals phase delays in the right sense, giving diameters of the envelopes typically of 10^{16} - 10^{17} cm. This is comparable with the sizes of the more massive planetary nebulae.

V.L.A. maps show pointlike structure for the strongest peaks and ring- or extended structure for the emission coming from halfway between the outer peaks, consistent with an expanding shell model. Combination

of the two kinds of observations yields a direct measure of the distance and the three dimensional structure of the envelope.

THE MASER STRENGTH OF OH/IR STARS, THE EVOLUTION OF MASS LOSS AND THE FORMATION OF A PLANETARY NEBULA

B. Baud
Laboratorium voor Ruimteonderzoek, Groningen

H.J. Habing
Sterrewacht, Leiden

From observations we find that the OH luminosity L_{OH} of an OH/IR star increases with R^2, where R is the size of the masing region. From this correlation we deduce that the mass loss rate M, the expansion velocity v_e and L_{OH} are related by $L_{OH} \sim (M/v_e)^2$. Next we consider the large range that is observed in L_{OH} and the steep OH luminosity distribution for OH/IR stars. Both facts can be explained by the postulate that these objects undergo accelerated mass loss, and thus steadily increase their OH luminosity. We propose that OH/IR stars are at the extreme end of the Asymptotic Giant Branch and that many of them are in the process of blowing off their entire envelope in a superwind phase. Their mass loss rate during this superwind, as deduced from OH observations of the circumstellar shell, is given by a simple modification of the Reimers equation. This modification connects the superwind continuously to the Reimers wind and it provides observational evidence for the formation of a planetary nebula.

CATALOGUE OF CENTRAL STARS OF PLANETARY NEBULAE

A. Acker
Observatoire de Strasbourg, France

The catalogue contains 460 nuclei of 393 true and 67 possible planetary nebulae; 87 of these were discovered after the publication in 1967 of the catalogue of planetary nebulae of Perek and Kohoutek.

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