DEDUCTION OF PLANETARY NEBULAE PROPERTIES FROM LONG PERIOD VARIABLE PRECURSORS

M.S. Bessell, P.R. Wood
Mt. Stromlo and Siding Spring Observatories, Canberra, Australia

Infra-red (JHK) photometry of long period variables (LPV) in the Magellanic Clouds has shown that the LPV's can be divided into core helium burning supergiants and asymptotic giant branch (AGB) stars. Application of the pulsation theory allows masses to be derived for the LPV's while stellar evolution theory allows core masses to be derived for the AGB stars. By considering evolution of the LPV's in the (M_{bol},P) diagram, estimates of planetary nebula mass and planetary nebula nucleus mass are derived as a function of initial mass. Spectra of the LPV's suggest that many low mass planetary nebulae in the Magellanic Clouds should be carbon rich while the more massive nebulae may be nitrogen enhanced.

SERRANO: Did you take into account steady mass loss on the AGB when calculating the evolution lines in your M_{bol} vs. P diagram? If not, the M_{core} vs. M_* relation is changed.

BESSELL: The masses shown are the present masses. If one estimates mass loss from the Reimers formula for $\theta = 1/3$, a present 3.5 $M_\odot$ Mira was a 4 $M_\odot$ Main Sequence star and a 2.0 $M_\odot$ Mira was a 2.2 $M_\odot$ Main Sequence star. For $\theta = 1$, the Main Sequence masses are 4.8 $M_\odot$ and 2.6 $M_\odot$, respectively.

RENZINI: The fact that AGB stars in the Galactic bulge are M-type, in contrast to stars of similar M_{bol} in the Clouds, which are carbon stars, does not necessarily imply that these stars do not dredge up carbon. Being about 30 times more metal-rich than their counterparts in the Clouds, they have to dredge up 30 times more carbon before showing as carbon stars.

BESSELL: That is true, however the dredge-up calculations of Wood indicate that high metallicity inhibits dredge-up at low luminosities, and, therefore, envelope ejection could take place before the star becomes sufficiently luminous for dredge-up to occur.

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