Obscured AGB Variables in the LMC

This paper is based on observations made at the South African Astronomical Observatory.

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abstract The characteristics of oxygen-rich and carbon-rich, large amplitude ($\Delta K > 0.4$ mag), asymptotic giant branch variables in the Large Magellanic Clouds are discussed, with an emphasis on those obscured by dust. Near-infrared photometry, obtained over about 8 years, is combined with published mid-infrared observations from IRAS and ISO to determine bolometric magnitudes for 42 stars. Pulsation periods of the O-rich stars are in the range $116 < P < 1393$ days, while those for C-rich stars have $298 < P < 939$ days. In addition to the regular pulsations, one O-rich star and four C-rich stars show large amplitude, $\Delta K > 0.6$ mag, secular or very long period variations which may be associated with changes in their mass-loss rates. We discuss and compare various methods of determining the bolometric magnitudes and show, perhaps surprisingly, that most of the very long period stars seem to follow an extrapolation of the period-luminosity relation determined for stars with shorter periods - although the details do depend on how the bolometric magnitudes are calculated.

Three stars with thin shells, which are clearly more luminous than the obscured AGB stars, are undergoing hot bottom burning, while other stars with similar luminosities have yet to be investigated in sufficient detail to determine their status in this regard. We suggest that an apparent change in slope of the period luminosity relation around 400-420 days is caused by variables with luminosities brighter than the predictions of the core-mass luminosity relation, due to excess flux from hot bottom burning.