ISO spectrophotometry of AGB stars in the LMC

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In this paper we discuss ISO spectrophotometry of a sample of 57 mass-losing Asymptotic Giant Branch (AGB) stars and red supergiants (RSGs) in the Large Magellanic Cloud (LMC). These objects were observed with ISO in photometric mode, and some of the sources also in spectrophotometric mode with ISOPHOT-S and ISOCAM CVF.

A radiative transfer code was used to model the spectral energy distributions of the sources to derive mass loss rates and luminosities. A clear gap separates the AGB stars from the RSGs. It is shown that the luminosity distributions of the optically bright carbon stars, dust enshrouded carbon stars and dust enshrouded M stars have very little overlap, suggesting that the dust enshrouded AGB stars are at the very tip of the AGB and will not evolve very much in luminosity before mass loss ends their AGb evolution.

The derived mass loss rates range from 10^{-3} to 10^{-7} $M_{\odot}$/yr. More luminous and cooler stars are found to reach higher mass loss rates. The highest mass loss rates exceed the classical limit set by the momentum of the stellar radiation field , due to multiple scattering of photons in the very dense circumstellar envelope. Mass loss rates are lower than the nuclear burning mass consumption rate for most RSGs. Two stars have mass loss rates that are higher than their nuclear burning rate, suggesting that RSGs shed most of their stellar mantles in short episodes of intense mass loss. Stars on the thermal pulsing AGB may also experience episodes of intensified mass loss, but their quiesent mass loss is already higher than the nuclear burning rate.