OBSERVATIONS WITH A MID-INFRARED CAMERA
OF AGB STAR ENVENUES

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Abstract.

We observed 17 AGB and post-AGB circumstellar envelopes with the mid-infrared camera TIRCAM. The collected photometry is compared with the IRAS LRS spectra and a two color diagram for the chemical classification of the dust is developed.

Key words: Stars, circumstellar shells – Infrared: sources

1. Introduction

Mass loss processes in the late evolutionary stage of intermediate and low mass stars known as Asymptotic Giant Branch (AGB), cause the formation of optically opaque circumstellar envelopes of dust and gas, which will later evolve into a planetary nebula (Habing, 1989). The dust component of the envelopes dictates the global optical properties of the circumstellar matter, and is responsible for the observed infrared emissions of these sources (continuum emission from dust, emission/absorption bands from silicates at 9.7 \( \mu \)m in oxygen-rich envelopes, and from SiC at 11.3 \( \mu \)m in carbon-rich ones). A transition from O-rich to C-rich envelopes is expected to occur in the AGB as a consequence of nucleosynthesis and mixing (third dredge-up, Willands and deJong, 1988); it can be analyzed by the IRAS [12]-[25], [25]-[60] color-color diagram (van der Veen and Habing, 1988), which locates in separate regions AGB envelopes in different evolutionary stages (although a complete separation between of O-rich and C-rich sources requires higher spectral resolution than available on the satellite).

A mid-infrared camera with a good sensitivity and angular resolution appears to be a suitable instrument to investigate AGB circumstellar envelopes in the transition stage.
2. Observations and Discussion

The mid-infrared camera TIRCAM (Tirgo InfraRed CAMera, Persi et al., 1994) equipped with a $10 \times 64$ SiAs array sensitive in the 5-25 $\mu$m wavelength range, was used in a few observing runs at the National Mexican Observatory of San Pedro Martir (SPM, Baja California) and at the Italian Infrared Telescope (TIRGO), in 1992–1994 years, for imaging and photometry of 17 envelopes around AGB stars (9 O-rich, 7 C-rich and one post-AGB).

For each sources we collected the images in the available filters (see Table 1). A good agreement was found between the photometry thus obtained and the Low Resolution Spectra (LRS, 1986) measured by IRAS.

A color–color diagram in the TIRCAM photometric system has been reconstructed in order to chemically classify the sources, being the [8.8]-[12.5] color related to the chemical nature of the dust (O-rich showing larger color with respect to C-rich) and the [8.8]-[9.8] color associated with the evolutionary stage of the envelopes (redder colors imply more evolved envelopes).

### Table I

<table>
<thead>
<tr>
<th>Filters</th>
<th>Band</th>
<th>$\lambda_{eff}$</th>
<th>$\Delta\lambda$</th>
<th>Chemical characteristics</th>
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<tr>
<td>F3</td>
<td>8.4–9.2</td>
<td>8.81</td>
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<td>F4</td>
<td>9.3–10.3</td>
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<td>11.9–13.1</td>
<td>12.49</td>
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References


