Carbon stars in the Magellanic Clouds: colours, properties and dust production rate

Ambra Nanni*[1], Paola Marigo* , Leo Girardi* , Stefano Rubele* , Alessandro Bressan* , Martin Groenewegen* , Giada Pastorelli* , and Bernhard Aringer*

[1]Università di Padova – Italy

Abstract

We employ newly computed grids of spectra reprocessed by dust to fit the spectral energy distributions (SEDs) of the entire sample of carbon-stars (C-stars) in the Small Magellanic Cloud (SMC). This procedure allows us to derive some important properties of these stars as well as their dust production rate (DPR). For the first time, the grids are calculated as a function of the stellar parameters, i.e. mass-loss rate, luminosity, effective temperature, current mass and carbon-excess, following a consistent scheme of dust growth coupled with stationary wind outflow. Our model accounts for the dust growth of various dust species formed in the circumstellar envelopes of C-stars, such as carbon dust, silicon carbide and metallic iron. The available grids are computed for different combinations of optical constants and grain sizes for carbon dust that have been shown to simultaneously reproduce the most relevant infrared colour-colour diagrams in the SMC.

Differently from the other works in the literature, our approach allows for the direct estimate of the mass-loss and of the DPR of these stars, without the need of assuming the gas-to-dust ratio, the outflow expansion velocity and the dust chemistry. These latter quantities are indeed consistently calculated by in our dust growth scheme.

The DPR provided by our method can be significantly different, of a factor between 2 and 5, from the ones available in the literature.

The same kind of investigation is currently ongoing for C-stars in the Large Magellanic Cloud and we here show our preliminary results.

*Speaker