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Comparative Studies of the Dust around Red Supergiant and Oxygen-Rich Asymptotic Giant Branch Stars in the Local Universe

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Abstract. We analyze the dust emission features seen in *Spitzer Space Telescope* Infrared Spectrograph (IRS) spectra of red supergiant (RSG) and oxygen-rich asymptotic giant branch (AGB) stars in the Large Magellanic Cloud and Small Magellanic Cloud galaxies and in various Milky Way globular clusters. The spectra come from the *Spitzer* Legacy program SAGE-Spectroscopy (PI: F. Kemper), the *Spitzer* program SMC-Spec (PI: G. Sloan), and other archival *Spitzer*-IRS programs. The broad 10 and 20 micron emission features attributed to amorphous dust of silicate composition seen in the spectra show evidence for systematic differences in the centroid of both emission features between O-rich AGB and RSG populations. Radiative transfer modeling using the GRAMS grid of models of AGB and RSG stars suggests that the centroid differences are due to differences in dust properties. We investigate differences in dust composition, size, shape, etc that might be responsible for these spectral differences. We explore how these differences may arise from the different circumstellar environments around RSG and O-rich AGB stars and assess effects of varying metallicity (LMC versus SMC versus Milky Way globular cluster) and other properties (mass-loss rate, luminosity, etc.) on the dust originating from these stars. BAS acknowledges funding from NASA ADAP grant NNX13AD54G.

Keywords. stars: AGB and post-AGB, (stars:) circumstellar matter

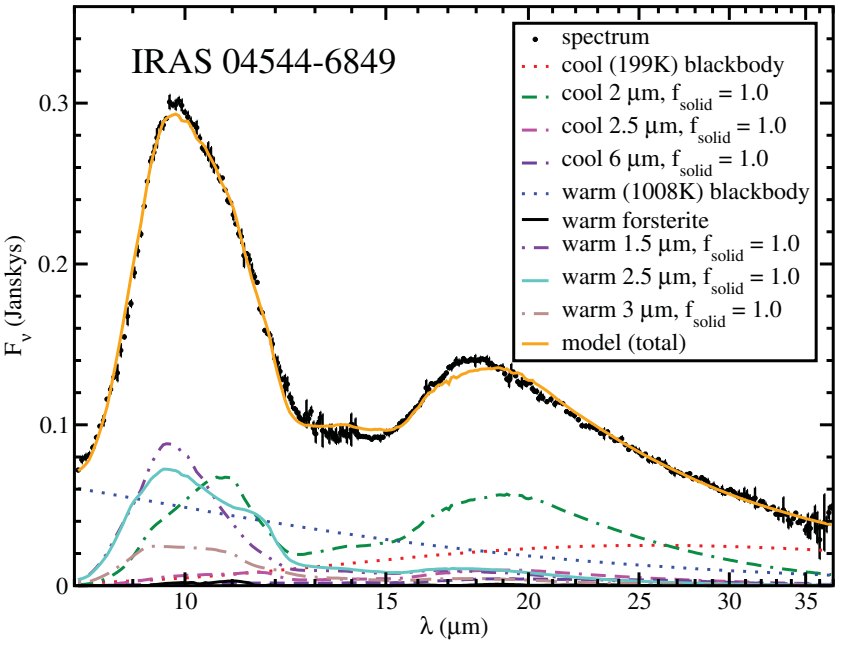

Figure 1. Shown is the dust model of IRAS 04544-6849, an oxygen-rich (O-rich) AGB star in the LMC, according to Jones *et al.* (2012). The data is from pid 3583 (PI: T. Onaka), AOR #11219968, with the spectrum reduced according to the methods described by Kemper *et al.* (2010). An O-rich GRAMS model from Sargent *et al.* (2011) has been fit to its optical/infrared spectral energy distribution, the stellar photosphere has been subtracted from the *Spitzer* Infrared Spectrograph spectrum, and the residuals are the black points in this plot being fit by the model (solid orange line). The model is of similar style to those of Sargent *et al.* (2009), except the components with size given in the legend are for spherical dust grains whose optical constants are those of the glassy silicates of cosmic composition from Speck *et al.* (2015).

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