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Dust production in low mass stars

Monday 11 June 2018 14:45 (35 minutes)

Outflows from asymptotic giant branch (AGB) and red supergiant (RSG) stars regulate the lifecycle of dust in the interstellar medium (ISM) in nearby galaxies. Metals produced in AGB nucleosynthesis are transported to the surface where they cool to form molecules and, further out, dust. The chemistry of this material depends on the surface atomic ratio of carbon to oxygen, resulting in either silicate-rich or carbonaceous dust.

Detailed radiative transfer is required to accurately model each AGB star; however, for a large sample such as the entire population in a galaxy, this becomes time-consuming. Astronomers thus either use proxies for the dust-production rate (DPR) such as the mid-infrared colour or the infrared excess. Along with my collaborators, I developed the Grid of RSG and AGB ModelS (GRAMS; Sargent et al. 2011 ApJ 728 93, Srinivasan et al. 2011 A\&A 532A 54), which can be used for quick estimates of the DPRs of a large sample via χ^2 fits to their spectral energy distributions (SEDs).

We have used this model grid to compute the dust budget in the Large (Riebel et al. 2012 ApJ 753 71) and Small (Srinivasan et al. 2016 MNRAS 457 2814) Magellanic Clouds, and are also in the process of estimating the dust budget in M33 and NGC 6822 (Srinivasan et al., in prep). As part of the Nearby Evolved Stars Survey (NESS), we are also determining the dust budget within 2 kpc of the Solar Neighbourhood (Trejo et al., in prep; see poster by Dr. Ciska Kemper).

When combined with results for Local Group dwarfs (DUSTINGs; Boyer et al. 2015 ApJS 216 10), we now have dust budget information over six decades in total stellar mass and seven decades in integrated DPR. I will describe our methods and findings in this talk.

Consider for a poster?

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Session Classification: Dust production in low mass stars

Track Classification: The creation and evolution of dust