Extended dust emission from nearby Asymptotic Giant Branch stars

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Asymptotic Giant Branch (AGB) stars are a primary contributor of heavy elements and dust to the Interstellar Medium (ISM). While we are able to accurately measure dust production rates by AGB stars in nearby galaxies, AGB stars within the Milky Way are often overlooked due to the difficulties in obtaining distances. Understanding AGB stellar dust emission properties and mass-loss histories leads to better understanding the ISM evolution of the Milky Way.

We present results of a search for extended dust emission from 15 AGB stars within 500 pc. Observations at 450 μm and 850 μm were carried out using the SCUBA-2 instrument on the James Clerk Maxwell Telescope (JCMT). These observations were combined with Herschel PACS observations at 70 μm and 160 μm from the MESS survey (Groenewegen M. A. T., et al., 2011, A&A, 526; Cox N. L. J., et al., 2012, A&A, 537). Using azimuthally-averaged surface brightness vs. radius profiles we determined the extension and percentage flux within the extended component for each source at the four wavelengths. Using these profiles we derived extensions at the 3-sigma level of up to ~40" for SCUBA-2 data and ~80" for PACS data. The fraction of the flux emitted from the extended region is ~40% for SCUBA-2 data and ~50% for PACS data. By fitting a modified black body to four-point SEDs at each radial point we derived the temperature, spectral index of dust emissivity (β), and dust column densities, in order to probe the dust mass-loss history, and detect any changes in physical properties of dust as a function radius (and hence, time).

This project is part of a larger survey, the Nearby Evolved Star Survey (NESS), which aims to determine the gas and dust return from a volume limited sample of galactic AGB stars using several sub-mm facilities.