Disclosing the stellar dust production in the Milky Way

MINIGRANT RSN2 2022
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Scheda: Evolved STARs and DUST formation
Funds: 20000 euros

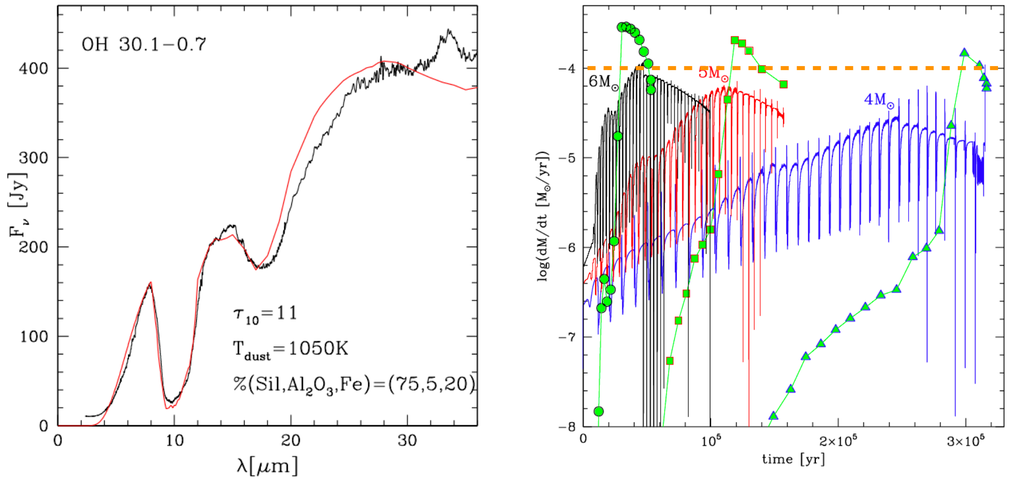
Infrared observations of asymptotic giant branch (AGB) stars, interpreted on the basis of stellar evolution and dust formation modelling, allow the characterization of the dust in the stellar surroundings. We propose to use this approach, so far applied to the Magellanic Clouds (MCs), to study AGB stars in the Galaxy for which it is possible to reconstruct the spectral energy distribution. This is a crucial step towards an exhaustive understanding of dust formation in the winds of AGBs, opening the possibility to extend the analysis done for the MCs to a higher metallicity environment, where the spectra of dusty sources exhibit more prominent features, that allow a deeper analysis of the dust properties. The outcome of this study will be important in the framework of James Webb Space Telescope observations.

Papers:

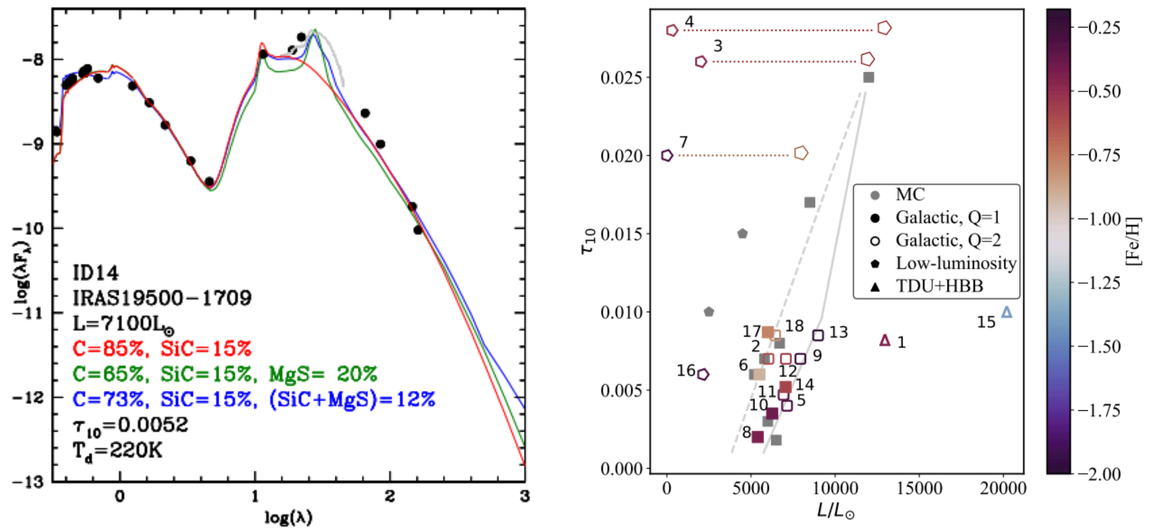
-S. Tosi, D. Kamath, F. Dell'Agli et al. (E. Marini co-author), 2023, A&A, 673, A41

-F. Dell'Agli, S. Tosi, D. Kamath et al. (E. Marini co-author), 2023, A&A, 671, A86

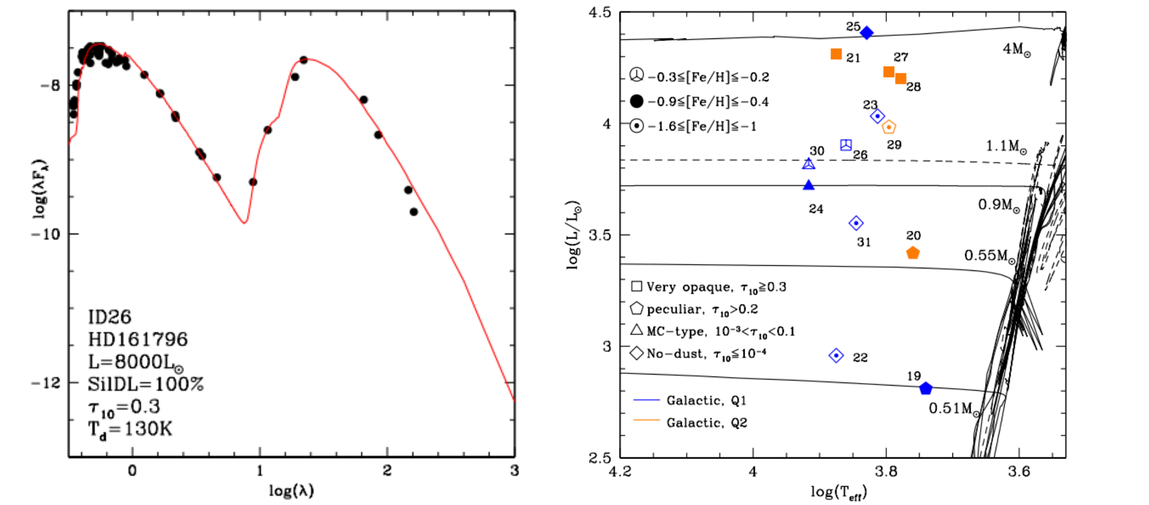
-E. Marini, F. Dell'Agli, D. Kamath et al., 2023, A&A, 670, A97



Left: best fit (red) of the ISO spectra (black) of one of the Galactic oxygen-rich AGB considered in Marini te al. (left). Right: Time variation of the mass-loss rate for stars of different initial mass calculated adopting different prescriptions: Blöcker 1995 (black, red and blue) and Vassiliadis & Wood 1993 (green). The latter is the treatment which allows to reproduce the high mass-loss rates obtained by fitting the ISO spectra.



Left: best fit (red) of the optical and IR data (black+grey) of one of the Galactic carbon-rich pAGB considered in Tosi et al. Right: Optical depths at 10 μm of the stars in the considered sample as a function of the luminosity of the star. The physical and dust parameters are derived from SED fitting. The vertical colour bar indicates the relative metallicity of the sources.



Left: best fit (red) of the optical and IR data (black) of one of the Galactic oxygen-rich pAGB considered in Dell'Agli et al. Right: Distribution of the considered sample on the H-R diagram, according to the data obtained by SED fitting. The evolutionary tracks used for the interpretation of the individual objects are also shown, including the late AGB and the post-AGB phase; the tracks considered here have a metallicity of Z = 0.004 (solid lines) and Z = Z (dashed line)

Activities so far:

-**Invited talk** given by the **Co-Pi** “Dust production from low- and intermediate-mass stars: insights from post-AGB stars and planetary nebulae” at the IAU Symposium, Krakow (September 2023)

-**Participation** of the **PI** to the COST NanoSpace JWST Training School 2023” (for proposals and data reduction), to achieve the expertise needed for the Task 3 of the project (June 2023)

-**Contributed talk** given by the **PI** “The intense production of silicates of Galactic intermediate mass stars” at the “Stellar Ages and Galactic Archaeology” Workshop Sexten (Italy), Sexten Center for Astrophysics (January 2023)

Proposals accepted:

-**LBT** - ”The Galactic post-AGB stars: the unique bridging of nucleosynthesis and dust production” that will be observed at Large Binocular Telescope (LBT) with the PEPSI instrument.

Budget description:

-Hardware: 2730,36 euros

-Travel to conferences or schools:

- Sexten, “Stellar ages and Galactic Archaeology”: 1.811,80 euros
- Russback school of nuclear astrophysics: 555,20 euros
- Krakow, IAU Symposium: 1200 euros

Future goals:

-Analysis and characterization of the Galactic carbon stars sample (Task 2), while eventually integrate the already published results of the Galactic M-stars sample (Task 1)

-Waiting for the outcome of the evaluation of the JWST proposal (Flavia Dell’Agli PI). If accepted, the data obtained will allow us to integrate our study of the Galactic AGB populations and dissecting their contribution to the dust budget of metal-rich galaxies in the Local Group (Task 3)

Critical issues:

-No important critical issues on the project have been found