Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: CA21126

Grantee name: Paolo Ventura

Details of the STSM

Title: On the evolution of molecular and dust species during the final stages of the stellar life

Start and end date: 4/8/2024 to 20/8/2024

Description of the work carried out during the STSM

Description of the activities carried out during the STSM. Any deviations from the initial working plan shall also be described in this section.

During the 16 days spent at the IAC institute of Tenerife I worked in collaboration with dr. Anibal Garcia-Hernandez, to develop a project focused on the description of the evolution of the late evolutionary stages of the life of low and intermediate mass stars, particularly for what concerns the transition from the final part of the so called asymptotic giant branch evolution, until the phase commonly known as planetary nebula. The ambitious task of the whole project is the detailed reconstruction of the series of events occurring since the stars depart from the asymptotic giant branch and evolve through the evolutionary phases preceding the white dwarf cooling, to allow us to understand how the spectral energy distribution evolves with time, according to the molecular and dust species formed.
During the period spent at IAC we considered a sample of planetary nebulae observed in the Large Magellanic Cloud, analyzed in a previous publication from the team involved in the project, and discussed the properties of the nebulae surrounding these objects, particularly the gas and dust content, in synergy with results from stellar evolution and dust formation modelling produced by our team, to relate the current properties of planetary nebulae with mass and chemical composition of their progenitors. The analysis developed led to important conclusion, such as the trend of the gas mass and of the dust-to-gas content with the progenitor's mass, which will prove extremely important on more general grounds, to evaluate the role played by the stars evolving through the asymptotic giant branch as dust manufactures.

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

Description of the STSM main achievements and planned follow-up activities

Description and assessment of whether the STSM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.

The collaboration with dr. Garcia-Hernandez led to the preparation of the draft of a paper, entitled "Planetary Nebulae of the Large Magellanic Cloud II: the connection with the progenitors' properties", which will soon be submitted to the Astronomy & Astrophysics journal The collaboration between the IAC group led by dr. Garcia-Hernandez and the Rome team coordinated by the visitor will be further pushed forward with the involvement in the project of dr. Flavia Dell'Agli, previous IAC post-doctoral fellow, now researcher at the Observatory of Rome, and with the applications to share one doctoral position and one post-doctoral position between the Observatory of Rome and IAC.