Why Galaxies Care About AGB Stars:
A Continuing Challenge through Cosmic Time
Proceedings IAU Symposium No. 343, 2019
F. Kerschbaum, M. Groenewegen & H. Olofsson, eds.

doi:10.1017/S174392131800741X

The Nearby Evolved Stars Survey: Project description and initial results

Peter Scicluna, on behalf of the *NESS* team

Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), 11F
Astronomy-Mathematics Building, No. 1, Sec. 4, Roosevelt Road, Taipei 10617, Taiwan
email: peterscicluna@asiaa.sinica.edu.tw

Abstract. The Nearby Evolved Stars Survey aims to observe over 400 evolved stars within 2 kpc, to determine why, and how much, *our Galaxy* cares about AGB stars. This contribution presents a brief introduction to the survey and data. NESS is an open project. Anyone is welcome to get involved and we aim to make as much data and code available to the community as possible.

Keywords. stars: AGB and post-AGB, stars: mass loss, circumstellar matter, stars: winds, outflows, surveys

1. Introduction

The Nearby Evolved Stars Survey (NESS) is a survey of galactic evolved stars in the sub-mm using the JCMT and APEX. We aim to observe over 400 evolved stars within 2 kpc of the Sun (see Fig. 1). Our primary objective is to determine the total gas and dust return to local ISM, but we also expect to explore global gas-to-dust ratios for individual sources, constraining sub-mm dust properties and the incidence of cold dust, and examine Galactic evolved stars as a population, amongst other goals.

2. Initial results

NESS data is being reduced and analysed by automated pipelines, some preliminary results of which are shown here (see Fig. 2 & 3). The pipelines automatically retrieve and reduce JCMT data, to give uniform data products. They also perform some simple analysis, for example fitting a simple function to the CO spectra to locate the line, and azimuthally-averaging SCUBA-2 observations to search for extended emission.

Further results can be seen in Dharmawardena *et al.* (this volume) and Wallström *et al.* (this volume).

3. Open Science

NESS is an open project - anyone is welcome to get involved. In addition, we plan to release raw, reduced and advanced products to the community through a catalogue hosted on the NESS website. We also aim to make all the code we write available as well as the data, via Github, so that our results are reproducible and the community can use the tools we develop. This includes automated pipelines, radiative-transfer fitting tools, machine-learning classifiers, and even the code used to generate plots.

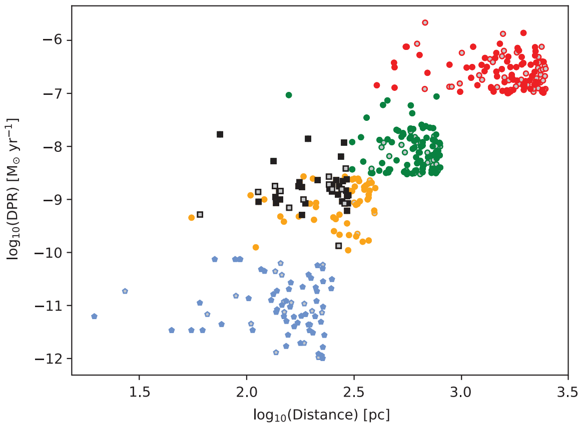

Figure 1. The distribution of NESS sources in distance–dust-production rate space. Sources with higher DPRs are selected out to larger distances as they are assumed to be intrinsically larger and brighter sources, and hence easier to detect. We aim to have a roughly similar number of sources in each of the 4 bins of DPR (each shown in a different colour). A smaller number of bright, nearby sources are selected for mapping in detail (black squares). Filled symbols indicate sources being observed with the JCMT, and outline symbols are being observed with APEX.

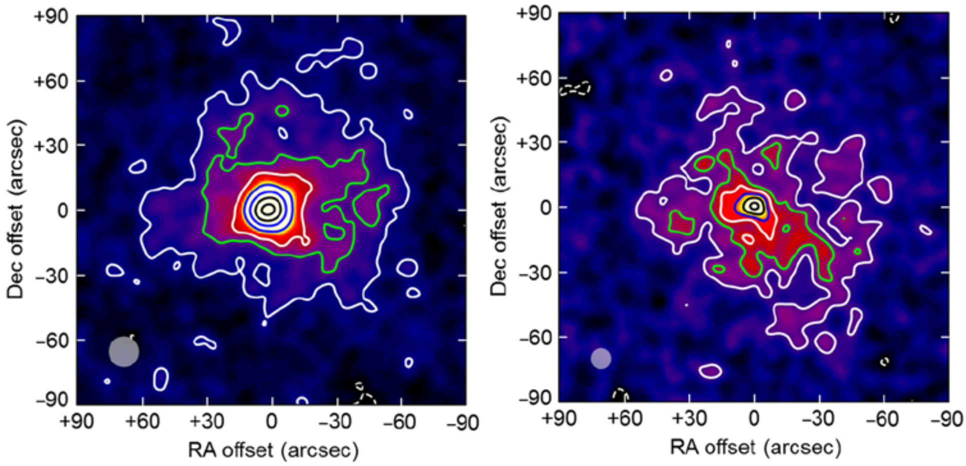

Figure 2. Example SCUBA-2 observations of T Cas (*left*: 850 μm, *right*: 450 μm). In both cases, the lowest contour is 3σ, and each successive contour is $+4\sigma$ thereafter.

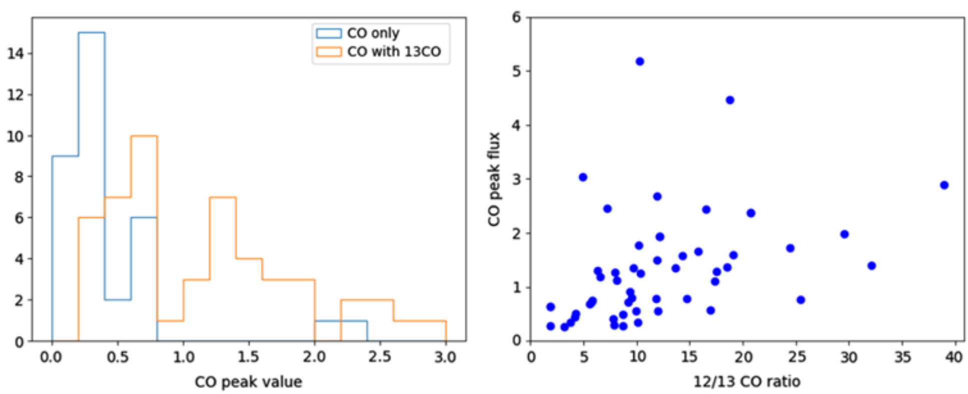

Figure 3. Distribution of pipeline-reduced CO(2–1) fluxes (left) and 12/13 CO ratios (right).

https://doi.org/10.1017/S174392131800741X Published online by Cambridge University Press