

## Silicon monoxide masers towards evolved stars

Asymptotic giant branch stars and red super-giant stars are common sources to power silicon monoxide (SiO) masers. Masers can be thought of as naturally-occurring radio-wavelength lasers, and are powered by energetic and exotic conditions in space. In this study, the SiO masers are powered by in-falling and out-flowing motions of gas surrounding an evolved star, most of which are called hydroxyl (OH) or infrared (IR) stars.

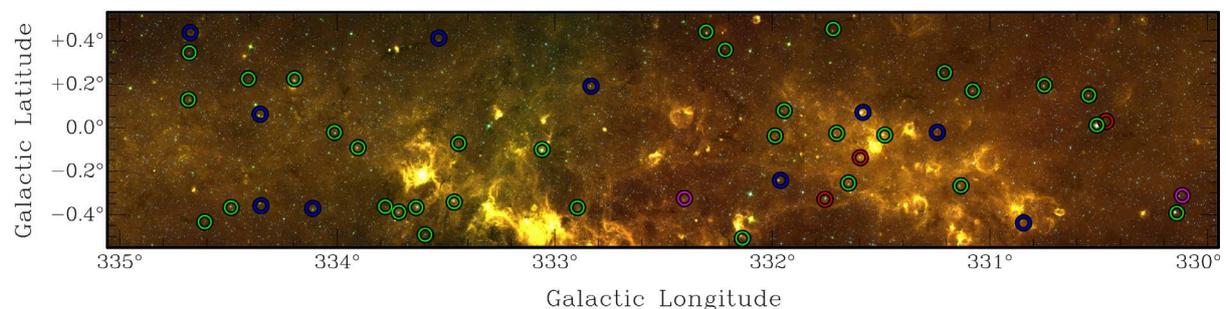
As not much is known about these masers, this project presents an opportunity to advance the "big picture" science of evolved stars. The student will process and analyse data collected with the Australia Telescope Compact Array, a radio telescope in northern New South Wales, with approximately 60 targets. Each of the target observations contains multiple spectral line transitions, including each of the  $v=1$ , 2 and 3 maser line transitions; any discovery of relationships between the different spectral lines will be an important contribution to the understanding of evolved OH/IR stars

In extremely rare cases, SiO masers can be excited by star-forming regions. A detection of this kind would be very important and have a high impact in the community, warranting further investigations.

In the course of this work, the student will develop a good understanding of interferometry and data processing. The results from this work could easily be formatted into a publication, which would be of huge benefit to a student pursuing research into the future with a PhD or masters project. The project is suitable as either a third year or an honours project.

### Aims of project

- (i) Identify maser locations in high-resolution data;
- (ii) Associate maser parameters with physical conditions;
- (iii) Constrain the physical conditions required to exhibit different types of masing conditions, and identify the properties of the  $v=3$  maser line.



*Figure: A three-colour image of different infrared maps overlaid with the locations of detected SiO masers. All masers appear to be associated with an OH/IR star. The data associated with this project are high-resolution follow-up observations of each of these locations to learn more of these environments.*