Master's thesis project in Space, earth and environment

The most enigmatic structures in the interstellar medium: the mystery of the Nessie filament

Background

Our home galaxy—the Milky Way—constantly produces new stars from its gas reservoir. Our understanding of how this happens is still greatly lacking; studying the process of how gas is converted into new stars is one of the most active fields in modern astrophysics.

Recent Galactic Plane surveys have revealed the existence of >100pc long filaments, the so-called Giant Molecular Filaments (GMFs). Characterizing the origin and evolution of these GMFs is essential to understand how most stars form in spiral galaxies. This project aims to explore the physical processes acting in the most prototypical GMF in the Milky Way, the "Nessie" cloud.

Task description

We have observed this GMF using the ALMA Compact Array (ACA) in Band 3 (93 GHz). Our observations mapped the molecular content of this cloud using a series of dense (N2H+) and diffuse (e.g. HNC) molecular tracers. The student will analyze these data, aiming at investigating the internal gas structure (integrated intensity maps) and dynamics (spectra) of the paradigmatic object. The resulting information will be interpreted with the help of different dynamical models, aiming at describing how the GMFs such as Nessie evolve and form new stars.

Required education and potential course requirements

"Interstellar Medium and Star Formation" (RRY041) and "Radio Astronomical techniques and interferometry" (RRY131) are highly recommended.

Basic computational skills with some common programming/scripting language are highly recommended (e.g., Python, Matlab, C++).

Credits

30 or 60 credits

Starting time

Any time.

Contact information to supervisor

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The project is done in collaboration with Asst. Prof. Alvaro Hacar, University of Vienna, Austria.