Master's thesis project in Space, earth and environment

Do we see magneto-sonic waves in the star-forming gas of the Milky Way?

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; the process of how gas is converted into new stars is one of the most active fields in modern astrophysics. A central concept related to star formation is understanding how different physical processes mould the gas so that conditions become favorable for gravitational collapse and formation of new stars. This Thesis project addresses one specific piece in the puzzle of these processes: are magneto-hydrodynamic waves, specifically magneto-sonic waves, responsible for some of the structures seen in dense gas clouds of the Milky Way. The question is addressed by analyzing observations of the density and velocity fields of the gas in one particularly suitable gas cloud. The comparison of the observations with theoretical predictions results in a picture of what is causing the observed structures. This, in turn, leads to knowledge about the role of magnetic fields in shaping the gas clouds towards star formation.

Task description

The student will reduce and analyze spectral molecular line emission data gathered with the ESO/APEX telescope. The observations will be used to map and characterize the velocity field of the gas. The information about the velocity field will be interpreted with the help of simple models of the gas cloud structure and ideal models of wave-propagation in it. Finally, the results will be used to assess the presence of magneto-sonic waves in the gas and to further constrain the structure of the gas cloud. The Thesis period includes an opportunity to visit a collaborating institute, Leiden Observatory, in Netherlands.

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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