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The physics and chemistry of the cold dust and gas around protostars

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Current studies on star and planet formation suggest that many molecules form on the surfaces on icy grains in molecular clouds from where they are then accreted onto the emerging protoplanetary disk and in some cases sublimate due to the heating by the young star. However, it remains unclear what role the surrounding environment and/or its evolution plays in regulating the chemistry.

The main goal of this work is to extract the physical and chemical parameters of the cold dust and gas around protostars, further exploring the role of the environment in the formation of complex organic molecules. This is achieved using recently obtained spectroscopic data from the ALMA's Compact Array (ACA) provided by the COMPASS ALMA Large Program for a set of protostars for which complex organic molecules are seen. Online catalogues are used to identify the species present in the observations, and comparisons with developed synthetic spectra help calculate physical parameters like the excitation temperature and the upper column density. Also, zeroth and first moment maps are produced to map the intensity and velocity range of each species, identifying the ones with interesting emission features; like the overly extended methanol emission present.

Moving forward, we can implement the same methods described above to other sources for further comparison. Eventually, the same regions will also be observed with JWST targeting the ices, aiming for a revelation of the complex interplay between the gas and ice species.

Field of study

Astrophysics

Supervisor

Jes Kristian Jørgensen

Primary author: MANOU, Anna (Niels Bohr Institute)

Session Classification: Poster session: Enjoy the posters!