

## Understanding the history of our Solar System – by observing young analogues

### Background

Stars form when molecular cloud cores start to contract under their own gravity. These cores always show rotation and the conservation of angular momentum during collapse has two consequences: (i) a disk (where planets eventually grow) is formed, and (ii) an outflow is launched, partly from the disk. In fact, our own Solar system is not unique, and we can understand its history, by observing young solar systems that are formed right now. Per Bjerkerli's research is focused on the earliest stages of star and planet formation. Firstly, studying the physics of outflows and protoplanetary disks is crucial to understand the initial conditions for planet formation and evolution. Secondly, to understand the chemical complexity of our own Solar system, and how life once could emerge here, we need to map out the detailed chemistry of nearby young protostellar regions where planets have yet not formed. In the "[Resolving star formation with ALMA](#)" and the "[Protostellar Interferometric Line Survey](#)" programs, we use the recently completed Atacama Large Millimeter/submillimeter Array in Chile, to observe young, nearby protostellar regions. *Observations at high sensitivity*, have provided an unprecedented view into the chemical complexity of young protostellar systems. *Observations at high spatial resolution* have allowed us to resolve and better understand the inner disk region where planets are formed and outflows are launched.

### Task description

The details of the project will be determined depending on the specific interests of the student, but will focus on the kinematics of gas close to protostars. One aspect can be to use advanced numerical simulations and/or radiative transfer models to explain the observed outflow and disk morphologies. Another aspect can be to analyze molecular emission maps using radiative transfer models, in order to trace the transition region between the infalling envelope and the disk.

### Required education and course requirements

The courses "Interstellar Medium and Star Formation" (RRY041) and Radio Astronomical techniques and interferometry" (RRY131) are highly recommended for this Master's research project. Programming skills, e.g., Matlab, Python, C++, etc., are helpful, but may also be developed as part of this thesis.

### Credits

30 or 60 credits

### Starting time

The project can start at any time.

### Contact information to supervisor

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