



ECOGAL: machine learning, data science and models applied to star and planet formation

Progetto di Ricerca - Research Project

The objective of the ERC Synergy project ECOGAL is to build a unifying predictive model of star and planet formation in the Milky Way. Based on a unique combination of theoretical modeling and multi-wavelengths observations, we will trace the properties of planet-forming disks back to their environment in different parts of the Galaxy, determine the physical processes that regulate the birth to stars and determine their key parameters, deliver a well calibrated galaxy template which can be used to study systems in the distant Universe. To reach these goals, ECOGAL unites out four research groups (at CEA, University of Bologna, Heidelberg University and INAF, in partnership with ESO, CNRS, Manchester University, and soon IRAM) to combine our unique expertise in observational astronomy, numerical astrophysics, instrument development, and astroinformatics, whose synergy will enable transformative progress in our understanding of our Galaxy.

One of the responsibilities of the Department of Physics and Astronomy of the University of Bologna (in short DIFA) within ECOGAL is the analysis of large bodies of observational data of young stellar objects with the goal of determining the chemical and physical properties of planet forming disks: the inheritance of these properties from the larger core scales and environment and how these are shaped by the interactions with forming planets.

The postdoc will work as part of a team of researchers, postdocs and students on developing and applying data analysis techniques for large and/or complex observational data from world leading observatories. The team will work on data to characterise the properties of gas and dust in protostars and protoplanetary disks, the properties of the central star and its interaction with the disk, as well as the detection and characterization of forming planets in the disk. The data will provide constraints to the numerical models being developed in other ECOGAL partners.

Description of activities - Piano delle attività

The postdoc will work at DIFA as part of a group of researchers, postdocs and students. The postdoc will work on one or more of the following projects, also supporting the mentoring of students:

- Development and application to real datasets of machine learning tools for the derivation of physical properties of young stars and planets from large datasets
- Development and application of machine learning tools to derive the physical and chemical properties of star and planet forming regions
- Develop and apply machine learning methods to compare theoretical models with observational datasets.
- Develop numerical and/or analytical models of protoplanetary disks and planet formation tailored to the interpretation of observational datasets.