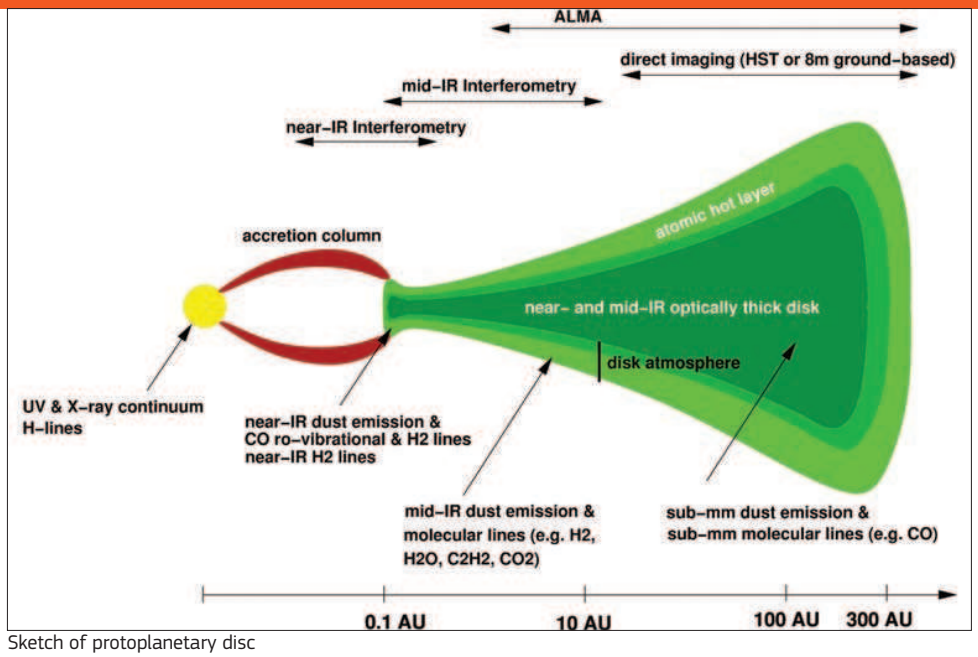
DiscAnalysis

Analysis and Modelling of Multi-wavelength Observational Data from Protoplanetary Discs



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Sketch of protoplanetary disc

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ABSTRACT

DiscAnalysis will collect multi-wavelength observational data from the birth-places of planets, from X-rays to cm wavelengths, to probe the gas and dust properties in these systems. Our modelling of this data aims at a detailed understanding of the physical and chemical conditions for planet formation.

UNDERSTANDING THE BIRTH-PLACES OF PLANETS

The search for planets outside of the solar system, related to the question "are we alone in the universe?", is undoubtedly one of the main science drivers for the current design of astronomical telescopes and instrumentation. In this FP7 project, we will study the birthplaces of such exo-planets, the so-called protoplanetary discs, by combining observational data for space-based telescopes with ground-based data, covering the whole electromagnetic spectrum from X-rays to cm wavelengths.

Large amounts of survey data exists, but are seriously under-utilised and usually not discussed in relation to each other. The project will mainly use FP7 resources for manpower to collect, analyse, and interpret the data by means of novel high-quality disc models. Besides archival data, our team has access to the latest results from ongoing observational key programmes (such as the Herschel space observatory, the Very Large Telescope VLT, and the Hubble space telescope HST), and these data need to be folded in to probe the conditions for planet formation, such as gas and dust density, temperature and chemical composition, over the discs' full radial extent.

Our team covers the required modelling know-how to reach an unprecedented level of completeness concerning the inclusion of important physical, chemical and radiative processes to be modelled (astrochemistry, gas heating & cooling, dust evolution, continuum & line radiative transfer, non-LTE modelling).

We also aim for a breakthrough in wavelength-coverage and completeness as to how the models are compared to observations (photometry, interferometry, line fluxes, line profiles and images). Based on these multi-wavelength data sets and our detailed modelling efforts, we will be able to determine the physical and chemical structure of the discs, and answer a number of fundamental questions related to planet formation, for example, how the gas and dust in discs evolve in time, how important the stellar UV and X-ray irradiation is, and how the presence of planets alters the disc structure. We will capitalise on our unique team expertise in observations and modelling to make the best use of existing European space-mission data, to explore disc evolution and the initial conditions of planet formation.

QUESTIONS & ANSWERS

What is the project designed to achieve?
To unify the different perspectives from various wavelength domains in the scientific community and to develop disc models applicable to the whole electromagnetic spectrum, and to apply these models to existing multi-wavelength observational data.

Why is this project important for Europe?
European space missions produce observational data for protoplanetary disc and planet formation research. Through this FP7 project, we will establish a transnational collaboration to compile coherent multi-wavelength data sets for a well-defined sample of protoplanetary discs.

How does this project benefit European citizens?
Everybody wants to know how planets form, how the water came to planet Earth, and why some stars have planets. To answer these fundamental questions about our own existence, we need a new international effort to combine astronomical observations obtained from different platforms.

STRENGTHENING SPACE FOUNDATIONS