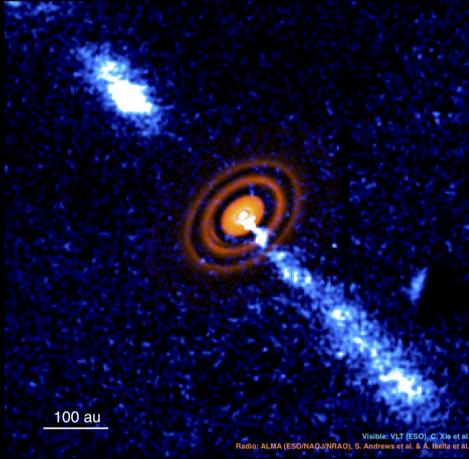


Protoplanetary discs in their infancy and the conditions for planet formation



SUMMARY.

Planet formation takes place in gaseous discs around young stars. Right after the formation of these discs, observations show these discs to be filled with tens to hundreds of Earth masses of pebble-sized particles. These small solids are of critical importance for the formation of the first planetesimals and the growth of planetary cores. Given their presence, it is thus plausible that planet formation is initiated in these early disc stages, well before the mass of this pebble component diminishes through radial drift in the subsequent millions of years of disc evolution. In this project you will explore how these discs form around the host star and evaluate if the conditions are hospitable for planet formation.

OBJECTIVES

- You will study the current literature (see references in the bibliography below) and make your own numeric/semi-analytic model of disc formation. Initially, this will be based on our classic understanding of disc formation. However, the aim is to expand on this to approximately take into account filamentary accretion streams.
- In the following project stage a connection can be made with both observations of young protoplanetary discs and state-of-the-art hydrodynamical simulations of star and disc formation (these are two areas of expertise at StarPlan).
- In the final part of the project, you will explore the possible implications on the evolution of the pebble component of the disc and the impact on planetesimal and planet formation through pebble accretion.

PREREQUISITES

There are no specific requirements, although familiarity with basic code development and plotting routines is a plus.

THEORY

The following areas of theoretical work will be touched upon: formation of protoplanetary discs - evolution of discs and their solids - fundamentals of planet formation

APPLICATIONS

The student will develop analytical work and own code to approximately model the formation of a protoplanetary disc.

MAIN PROGRESSION STEPS

The project will have approximately the following structure:

- week 1-2: set up basic model
- week 3-4: literature review
- week 5-6: expand model
- week 7-8: finish written report and prepare group presentation

- week 9: give group presentation

EVALUATION

- The student will be asked to produce a written report of the project and give a presentation for the planet formation group in Copenhagen (these cover 60% of the final mark, the remaining 40% will be the jury presentation).
- The student will be evaluated on work commitment, level of understanding, progress made, and the quality of the written and oral presentation.

BIBLIOGRAPHY & RESSOURCES

- Appelgren et al 2020: [ADS](#)
- Kuffmeier et al 2017: [ADS](#)
- Kuznetsova et al 2022: [ADS](#)

CONTACT

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