
Cloud formation in 3D exoplanet atmospheres

Leen Decin
Institute for Astronomy
KU Leuven, Belgium
leen.decin@kuleuven.be

Christiane Helling
School of Physics & Astronomy
University of St Andrews, UK
ch80@st-andrews.ac.uk

Project Description

As result of formation and evolution processes, exoplanets can have hugely different properties, e.g. giant gas planets, rocky planets, mini-neptunes and possibly carbon-rich planets. The understanding of these objects is, to a large extent, hampered by clouds obscuring their atmospheres. Clouds play a key role for the atmospheric dynamics and chemistry, as they are important opacity sources and deplete the local gas phase chemistry. The objective of this project is to understand the impact of clouds on the habitability conditions of an exoplanet, and implement detailed cloud and haze formation descriptions in exoplanet climate model simulations for (Super-)Earths. The PhD student will include a kinetic cloud formation model (nucleation, surface growth/evaporation, gravitational settling, element conservation; see Woitke & Helling 2003; Helling & Woitke 2006) into the general circulation model (GCM) code developed at the Leuven host institute for improved analysis of existing data and as preparation for coming data from JWST, ARIEL, ELT, PLATO and other future facilities.

Innovative Training Network (ITN) - CHAMELEON

This project is part of the Marie Skłodowska-Curie Innovative Training Network (ITN) **CHAMELEON** “Virtual Laboratories for Exoplanets and Planet Forming Disks” (chameleon.wp.st-andrews.ac.uk). The ITN combines the expertise of eight European research institutes (Universities of St. Andrews, Groningen, Copenhagen, Edinburgh, Leuven and Antwerp, the Max-Planck Institute in Heidelberg and the Netherlands Institute for Space Research) to cover all relevant aspects for this complex modelling task, joining the expertise in planetary atmospheres and protoplanetary disks, including observation and interpretation. The network will consist of 15 Early Stage Researchers (PhD students) and the respective supervisors/local research groups. For a complete list of all open PhD positions within this training network please visit <http://chameleon.wp.st-andrews.ac.uk/>.

The Host Institutes

The Institute of Astronomy of KU Leuven in Belgium is a vibrant research group of some 70 scientists, engineers, and administrative staff (fys.kuleuven.be/ster), including 6 full-time and 3 part-time professors. The institute is an expertise centre in stellar physics and active in several international consortia and collaborations, involving telescopes at observatories worldwide and in space. The IoA is responsible for the organisation of the 2-year Master in Astronomy & Astrophysics at the Faculty of Science and operates the 1.2m Mercator telescope at La Palma Observatory, Canary Islands.

The School of Physics & Astronomy at the University of St Andrews is an active member of the St Andrews Centre for Exoplanet Science (<https://www.st-andrews.ac.uk/exoplanets/>) which leads an interdisciplinary agenda on exoplanet research. St Andrews is renown for exoplanet research ranging from exoplanet discovery and characterisation, atmosphere chemistry and thermo-chemical disk modelling, to the impact of the host star on the exoplanet system.

The Position

The selected PhD students will be offered a 2+2-year dual-joint contract, with training secondment (of 12 months) for this position foreseen at the University of St. Andrews. The salary will be commensurate to the

standard scale for PhD students in Belgium; it includes social and medical insurance as well as pension rights. The successful PhD applicants will have to register at, and comply with, the regulations of the Arenberg Doctoral School of the KU Leuven and the St. Leonard's Postgraduate College at the University of St. Andrews. The successful PhD applicants will follow a doctoral programme including personal training in management, science communication, and teaching.

We seek an excellent student with a strong background in physical sciences, chemistry, mathematics and/or astrophysics. A successful candidate must hold a Masters degree or equivalent by the starting date of the position. Previous research experience on planet forming disks, astrochemistry, and/or mid-IR spectroscopy and a track record of team work/mobility will be important criteria for the selection. Note that the general eligibility and mobility rules of Marie Skłodowska-Curie Actions apply, i.e. applicants must not have resided or carried out their main activity (work, studies, etc.) in the country of the recruiting partner for more than 12 months in the 3 years immediately before the recruitment date.

Instructions to apply

The application package should be sent **as one single PDF** containing

- (i) a curriculum vitae, with a publication list if relevant;
- (ii) a statement of interest (max. one page, including a brief description of research interests and relevant experience);
- (iii) copies of university grades, certificates and/or diplomas;
- (iv) two letters of reference to be sent by the application deadline (references are welcome to send their letters directly to clio.gielen@kuleuven.be);
- (v) a statement that confirms that you understood the requirements of the joint degree and the Marie Skłodowska-Curie mobility criteria as outlined on <https://chameleon.wp.st-andrews.ac.uk/recruitment/>.

The application material should be sent as one PDF by e-mail to Clio.Gielen@kuleuven.be with subject "PhD-CHAMELEON_ESR3-applicantname" by February 3rd 2020 (or until the positions are filled).

Applications that do not strictly follow these guidelines will not be considered.