Charge conservation and cloud formation in planet atmospheres

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Project Description:
As result of formation and evolution processes, exoplanets can have hugely different properties, e.g. giant gas planets, rocky planets, mini-neptunes. Today's best constrained exoplanets are short period, hot Jupiters which show `muted' molecular features, enhanced Rayleigh scattering slopes in the optical, and dynamic features like onsets in the brightest optical emission of the planet. These features arise from a globally circulating and cloud forming atmosphere (Lee et al. 2016 MNRAS 640) which is driven by an intense irradiation field from the host star. Both, dynamics and radiation ionise cloud particles (Helling et al. 2011, ApJ 737; Rodíguez-Barrera et al. 2018, A&A 618).

In order to understand the myriad of observational data from present (HST, Spitzer) and future space missions (CHEOPS, JWST, Ariel, PLATO), a thorough understanding of the cloud formation processes is required. The key processes to cloud formation, nucleation and surface growth, will be studied under the effect of ionisation. The effect of ionised particles is essential for cloud formation on Earth but little is known for exoplanets.

Innovative Training Network (ITN) - CHAMELEON
This project is part of the Marie Sklodowska-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/recruitment/.

The Host Institutes

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

(http://astronomy.wp.st-andrews.ac.uk). In Copenhagen, the student will be part of the active environment in the Niels Bohr Institute's section for Astrophysics and Planetary Science, which covers aspects of exoplanet research, proto-planetary disk formation, formation of our solar system, meteorites and exploration of Mars.

The positions

The selected PhD students will be offered a fully funded PhD place for 3.5 years with a required training secondment for this position foreseen at the University of Copenhagen for 1 year, with additional short trainings at the University of Groningen. The funding will be commensurate to the standard scale for PhD students in according to the Marie-Curie funding rules. The successful PhD applicants will have to register at, and comply with, the regulations of the St Leonard's Postgraduate College at the University of St Andrews and the rules from the University of Copenhagen, and will obtain a double degree from the two universities after 3.5 years. The successful PhD applicants will follow a doctoral programme including personal training in management, science communication, and teaching.

Requirements

We seek an excellent student with a strong background in physics or astrophysics. Successful candidates must hold a Masters degree or equivalent by the starting date of the position. Previous research experience on planet forming disks and/or astrochemistry, and a track record of team work/mobility will be important criteria for the selection. This is a computational project: some prior knowledge of coding would be useful (e.g., Python and Fortran). Note that the general eligibility and mobility rules of Marie Sklodowka-Curie Actions apply, i.e. applicants must not have resided or carried out their main activity (work, studies, etc.) in the country of the main host institution for more than 12 months in the 3 years immediately before the recruitment date. If you have been residing in the UK, please consider to apply to the open positions of our European partner institutions (https://chameleon.wp.st-andrews.ac.uk/recruitment/).

Application documents

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;

(v) a statement that confirms that you understood the requirements of the joint degree and the Marie Sklodowska-Curie mobility criteria as outline on https://chameleon.wp.st-andrews.ac.uk/recruitment/.

Use the portal of the School of Physics & Astronomy in St Andrews University https://www.st-andrews.ac.uk/physics/prosp_pg/phd/index.php to upload your application documents.

Application deadline: 3 February 2020

The application process will continue until the position is filled.