PhD project: “Cloud formation and cloud properties on Earth and in exoplanets”

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Something about myself

Background:

- Bsc in Physics at Sapienza University (Rome)
- “SPLASHY” project
- Msc in Astronomy and Astrophysics at Sapienza University (Rome)

Current position: PhD student at KU
Scientific interests

- Planets and exoplanets
- (Exo-)atmosphere
- Cloud formation and climate models
Master thesis project

Science case:
- Observation of exo-atmospheres with EXCITE - EXoplanet Climate Infrared Telescope

Tasks:
- Selection of targets
- Feasibility of phase curve spectroscopy of Hot Jupiters
- Preliminary analysis of typical systematics affecting balloon-borne telescopes
- Design the logo
Phase curve of a planet

Phase curve: planet flux variations as a function of the position along the orbit (phase angle $\alpha$)

Phase curve example Parmentier et al. 2018
Phase curve spectroscopy

Planet spectrum
- **VIS** → reflected star light (albedo, presence of clouds/aerosols)
- **IR** → thermal emission (molecular transitions)

Phase curve spectroscopy
- Chemical composition
- Energy balance

Spectroscopic phase curves of WASP-103b - Kreidberg et al. 2018
Phase-resolved spectroscopy

Planet spectrum at different orbital phases

Longitudinal and vertical structure of the atmosphere → thermal profile, detailed thermodynamics

T-P profile at different orbital phases
EXCITE science return

- 3D structure of the atmosphere
- Climate dynamics
- Brown dwarf-like transitions (?)

Accurate atmospheric models including cloud formation are required!
PhD project

- **Topic:** Atmosphere and climate **modeling**
- **Goal:** better understanding of climate dynamics of exoplanets through the study of cloud formation and properties
- **How I want to proceed after my Msc:**
  - Expand my knowledge of atmospheric and climate models
  - Improve my computer programming skills
  - Dedicate my research to cloud formation and cloud properties
Thanks for your attention!