MARCS models for cloudy hot-Jupiters

Beatriz Campos Estrada[1,2] , CHAMELEON MC-ITN PhD

Collaborators: Uffe G. Jørgensen[1], Christiane Helling[2], Peter Woitke[2]

[1] Centre for ExoLife Sciences, Niels Bohr Institute, University of Copenhagen
[2] Space Research Institute, Austrian Academy of Sciences

beatriz.estrada@nbi.ku.dk
@exobeatriz

Motivation

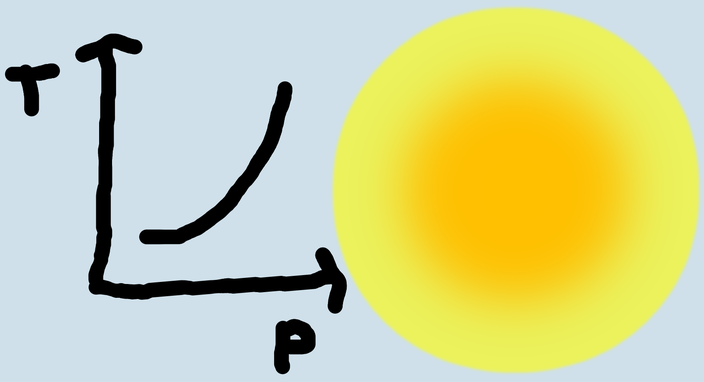
- ☆ Clouds obscure planetary atmospheres and surfaces.
- ☆ By modelling self-consistently cloudy-exoplanetary atmospheres we can infer atmospheric and surface compositions with improved accuracy.
- ☆ This poster presents preliminary results of the structure of a cloudy hot-Jupiter atmosphere modelled self-consistently with a new combination of `MARCS` [1], `GGchem` [2] and `StaticWeather` [3][4] .

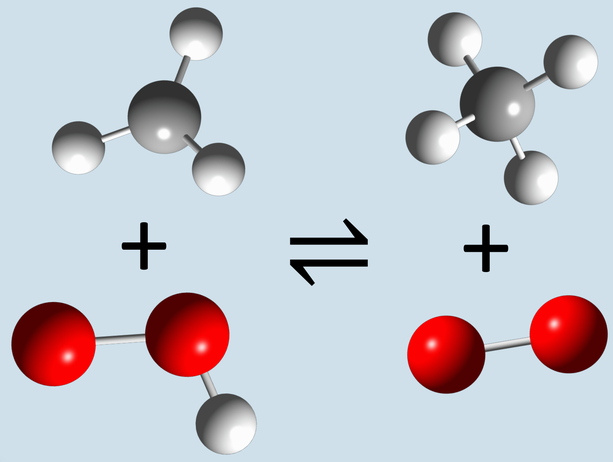
A self-consistent planetary atmospheres model

`MARCS`
Stellar atmospheres model thoroughly tested against observations.

`GGchem`
Equilibrium chemistry model down to 100K.

`StaticWeather`
Cloud formation model with detailed chemical/physical processes.





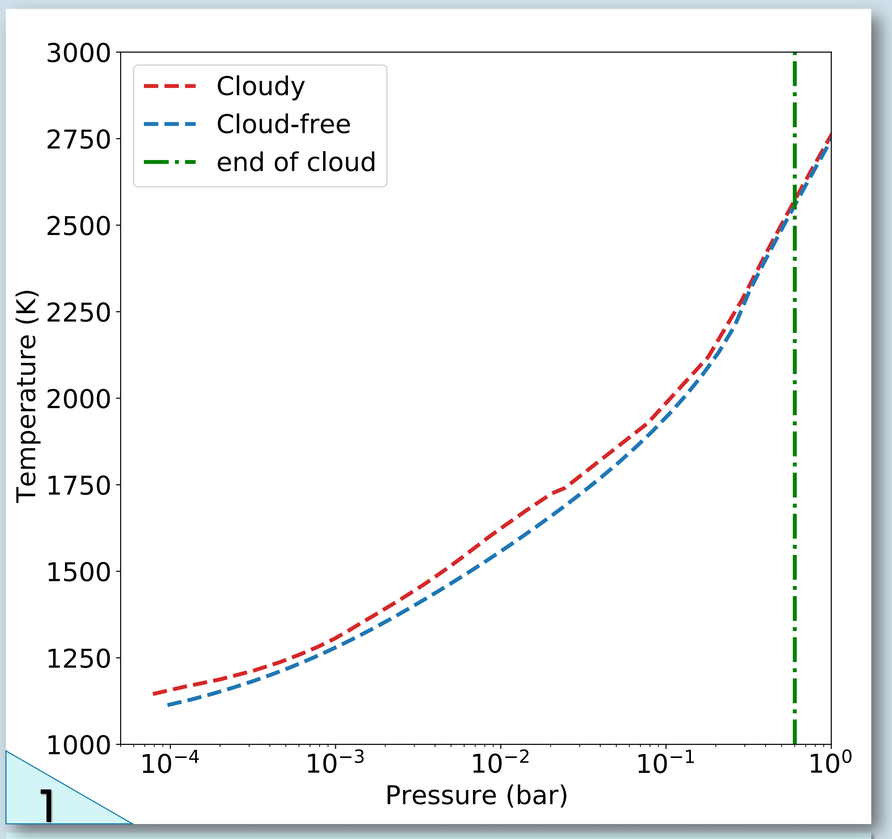
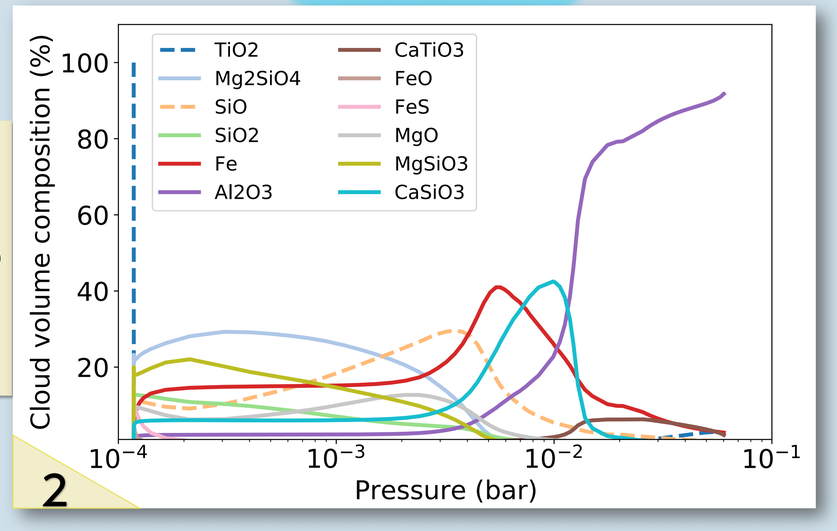


Figure 1: Temperature-Pressure profiles of a `MARCS` atmospheric model at an effective temperature of 2400K, with (red) and without (blue) clouds. The green line indicates the end of the cloud layer as modelled by `StaticWeather`.

Figure 2: Cloud volume composition in percentage. The figure shows all dust species used in the model. TiO_2 and SiO (dashed curves) are the nucleation species.



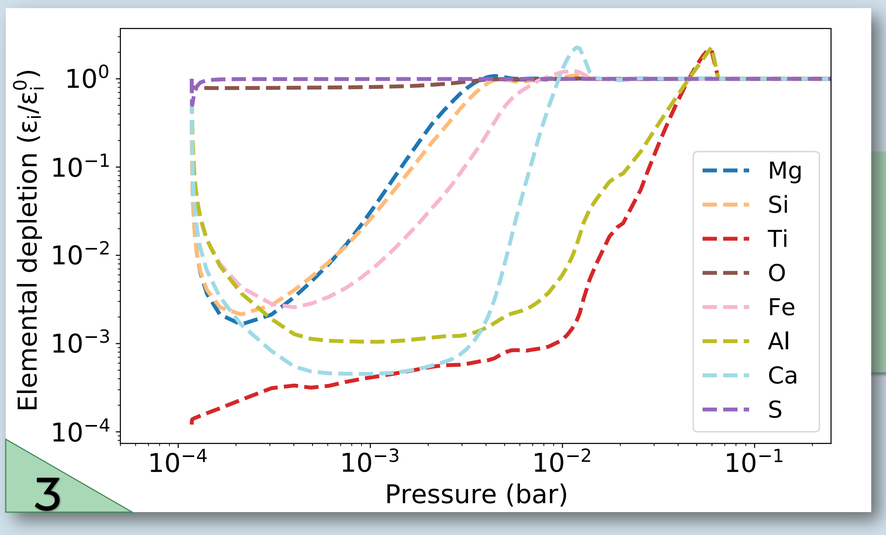
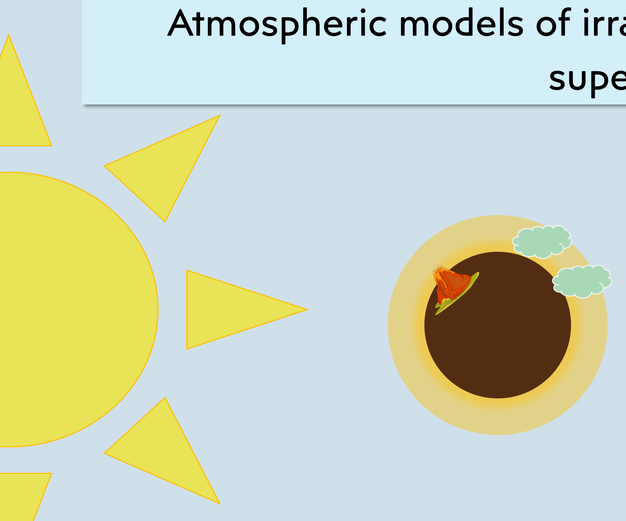
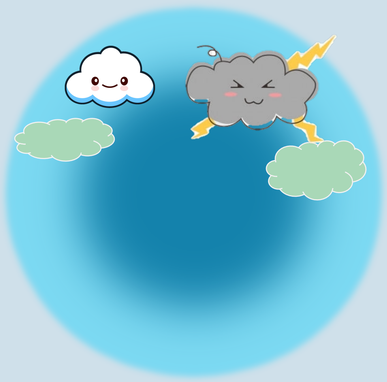


Figure 3: Elemental depletion in terms of the gas phase elemental abundances. The model is set to solar abundances at the start.

Coming soon...

Atmospheric models of irradiated cloudy hot-Jupiters and super-Earths!





References

[1] Gustafsson, B., et al., 2008, A&A, 486, 951
[2] Woitke, P., et al., 2018, A&A, 614, A1
[3] Helling, Ch., et al., 2016, MNRAS, 460, 855
[4] Juncher, D., et al., 2017, A&A, 608, A70

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860470.

UNIVERSITY OF COPENHAGEN

MARIE CURIE ACTIONS

ÖAW IWF