Posters

Vertical Mixing in Hot Jupiter Atmospheres: 2D post-processing coupling general circulation and disequilibrium chemistry

Robin Baeyens,[1] *KU Leuven*

In the study of exoplanets and their atmospheres, numerical models are indispensible tools. Simulations with various degrees of sophication are used to aid in the interpretation of observational results, and to provide a thorough understanding of the often complex interplay between the physical and chemical processes at play in exoplanet atmospheres.

In order to constrain the abundances of chemical species in the atmospheres of hot Jupiters, a three-dimensional general circulation model[2] and a pseudo-two-dimensional chemistry code[3] were applied in series. By adopting this approach, the degree of vertical mixing in the atmosphere was quantified locally and used as a well-constrained input parameter for the chemistry code. The latter was then employed to solve for the molecular abundances in the atmosphere, taking into consideration both photochemistry and the dynamical disequilibrium effects caused by wind advection.

From the general circulation a localized region of strong vertical mixing was identified at the night side of the planet. Eddy diffusion coefficients in this region can be up to an order of magnitude larger than the atmospheric average. Furthermore, it was found that the mixing in this region has a significant effect on the abundances of molecules such as CH4, CO2 and NH3, when compared to equilibrium chemistry or previously adopted values for the eddy diffusion coefficient.

In the future we plan on further investigating the physical nature of this localized mixing region, as well as continuing to characterize the physical and chemical nature of exoplanet atmospheres using this setup.

[1] robin.baeyens@kuleuven.be

[2] MITgcm, Marshall et al., 1997

[3] Agundez et al., 2014