LOOKING INSIDE EXOPLANETS. EXOPLANETARY ATMOSPHERES

M.Lampón[1], L.M.Lara[1], J.L.Gómez-González[2], and J.Jimenez-Ortega[1]
[1]Instituto de Astrofísica de Andalucía (CSIC), [2]Centro de Astrobiología (INTA-CSIC).

Abstract: If we want to help to obtain answers to scientific key questions like, what are exoplanets made of?, why are planets as they are?, how were they formed and how did they evolve?, we have to understand their atmospheres, so to be able to build suitable exoplanetary atmospheric models.

For this purpose, we are developing the necessary tools. At present, we are able to build two types of exoplanetary models, equilibrium and disequilibrium one-dimensional atmospheric models, taking into account for the second one type, photo-absorption and subsequent dissociation of the species, neutral-neutral chemical reactions and transport (eddy and thermal diffusion) processes.

In the near future, our model will be complemented with new tools for describing others disequilibrium processes (as condensation, influx material, etc.) and therefore will let us to reach a deeper understanding on how different processes shape an exoplanetary atmosphere.

In this work, we show a sample of two exoplanetary atmospheres, one representing hot Jupiter-like and another to a hot Neptune-like. For both planets, we build several one-dimensional equilibrium and disequilibrium chemical atmospheric models.
The purpose of this work is to show the different variables that seriously affect the characterization of the system.

Figures:

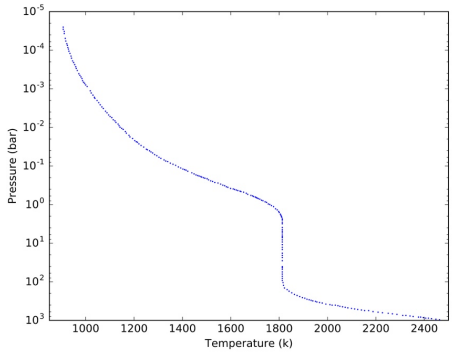

Figure 1: Vertical profile of temperature from hot Jupiter HD 189733b [1].

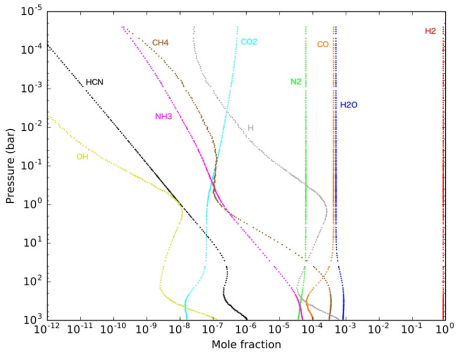

Figure 2: Vertical distribution of molecular abundances in our equilibrium thermodynamic model for 1X solar elemental abundance from hot Jupiter HD 189733b. Solar elemental abundance from [2].

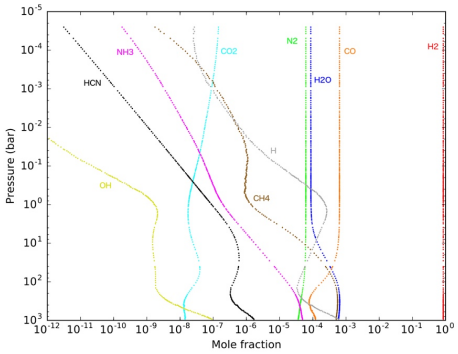

Figure 3: Vertical distribution of molecular abundances in our equilibrium thermodynamic model for 1X solar elemental abundance and C/O=0.88 from hot Jupiter HD 189733b. Solar elemental abundance from [2].

References: [1] Moses, J. I., Madhusudhan, N., Visscher, C., Freedman, R.S., 2013, **ApJ**, 763, 25. [2] Lodders, K., Palme, H., & Gail, H.-P. 2009, in The Solar System, Landolt- Bornstein, New Series, Vol. VI/4B, ed. J. E. Trumper (Berlin: Springer), 560.