A Fully-Consistent 1D Radiative-Convective Equilibrium Model for Planetary Atmospheres

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Résumé

I will present new results from a study of non-equilibrium chemistry in exoplanet atmospheres under conditions relevant to highly irradiated exoplanets. I will show that non-equilibrium chemistry can affect the temperature structure of hot Jupiter atmospheres with a large impact on the nightside (a few hundred Kelvin) but a much smaller effect on the dayside. This highlights the need to use both 1D and 3D models together, in a complimentary manner, to study these asymmetric planets. We have developed a 1D radiative-convective equilibrium atmosphere model, coupling consistently hydrostatic equilibrium, radiative transfer and chemistry. I will also briefly discuss our current developments, the implementation of our non-equilibrium chemistry code in the Met Office UM, a sophisticated general circulation model (GCM). Previous studies either assume chemical equilibrium or do not allow non-equilibrium chemistry to feedback on to the background atmosphere, and none so far have included chemical kinetics in a 3D GCM.

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