High-temperature chemistry and photochemistry

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Résumé

Because of observational biases, most known transiting exoplanets are very close to their parent stars. Thus, the atmosphere of these transiting hot Jupiters and warm Neptunes can be studied by spectroscopy at the primary or the secondary transit. Photochemical models are then used to understand in details the chemical composition of these atmospheres.
Because of the small distance between the planet and the star, planetary atmospheres of these warm exoplanets present high temperatures, varying roughly from 500 to 2500 K. To model correctly these atmospheres, data corresponding to this range of temperature must be used.

In this view, we have developed two chemical schemes derived from combustion studied and validated experimentally at high temperatures (Venot et al. 2012 and Venot et al. 2015).
Moreover, hot Jupiters and warm Neptunes being highly irradiated, photodissociations are important in their atmospheres. Unfortunately, data to model the photolysis processes are very sparse at high temperature, so absorption cross-sections at ambiant temperature are commonly used. To address this lack, we set up a project to measure the VUV absorption cross-section of the main molecules of planetary atmospheres.

I will present the high-temperature chemical schemes as well as the experimental measurements of absorption cross sections.

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