Modeling the atmosphere of Hot Jupiter using the generic Planetary Climate Model: The impact of clouds on atmospheric dynamics and observables.

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We set out to use the generic Planetary Climate Model, a 3D Global Climate Model developed for Solar System planets and temperate exoplanets studies to simulate the atmosphere of Hot Jupiter. We modeled a set of iconic Hot Jupiters with different surface gravity, equilibrium temperature, radius , orbital period and irradiation temperature. In our set of simulations the gravity ranges one order of magnitude and the orbital period almost one order of magnitude. The modeling of those well-known hot giant exoplanets is a good illustration of possible atmospheric regimes and a stress test for the generic PCM model, both for the dynamical core and for the cloud physics used to study the climates and paleoclimates of Solar System planets. We post-processed our simulations to produce phase curves, transit and eclipse spectra and compared them to publicly available observations from space-based observatories. We will discuss these results during our talk. Moreover, we developed and incorporated into the model a scheme to simulate the formation of clouds and to take into account their radiative feedback on the atmospheric structure. Our cloud forming scheme is local, meaning that clouds will or will not form depending on the local temperature-pressure conditions. Probing different temperature regimes therefore makes it possible to study the formation of different condensates and their impact on the atmosphere. We tested our scheme using different possible condensates and different particle sizes. We will present our results on cloud dynamics for the parameter space probed in this study. We will also discuss our findings on the impact of cloud feedback on atmospheric dynamics and observables.