Study of the Atmosphere of Hot Jupiter

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Abstract: Nearly four thousand exoplanets, i.e., the planets outside the solar system (exoplanets) are discovered in the past two decades using various ground and space-based telescopes. The composition of the exoplanetary atmospheres is governed by the physical parameters of the star-planet system. Some of these parameters are surface gravity, metallicity, stellar flux, internal heating, and orbital properties of the planet. These parameters span over a continuous range of parametric space. To simulate the atmospheric composition of these exoplanets, we need a large number of interconnected chemical reactions, along with predefined physical parameters of the system. In this work, we work with a python-based code to simulate the atmosphere of exoplanets. We use the eddy diffusion coefficient to replicate the atmospheric dynamics. This code contains photochemistry, which helps to find the chemical composition at the top of the atmosphere. This code uses a reduced C-H-O-N chemical network with a total of 1400 chemical reactions, out of which 150 are photochemistry reactions. We plan to identify the most critical reactions and develop analytic expression for rates, which can then be used in computationally challenging radiative transfer models.