

Modeling Clouds in Brown Dwarf and Exoplanet Giant Planet Atmospheres

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Abstract

Clouds and hazes are commonplace in the atmospheres of solar system planets and are likely ubiquitous in the atmospheres of extrasolar planets as well. Clouds affect every aspect of a planetary atmosphere, from the transport of radiation, to atmospheric chemistry, to dynamics and they influence - if not control - aspects such as surface temperature and habitability. In my presentations I aim to provide an introduction to the role and properties of clouds in exoplanetary atmospheres and will discuss the lessons learned from the past two decades of studying clouds in brown dwarf atmospheres. I will consider the role clouds play in influencing the spectra of extrasolar giant planets and will discuss the relative simple approaches that have been taken so far to model exoplanet clouds. I will also review how the scattering and extinction efficiencies of cloud particles may be approximated in certain limiting cases of small and large particles in order to facilitate physical understanding and will discuss the need for optimized cloud models that can be applied to exoplanet transmission spectra. Finally I will discuss the various sources of aerosol opacity,

including photochemistry, disequilibrium chemistry, and equilibrium condensation.