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Simulating haze radiative feedback in general circulation models of hot Jupiters

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Photochemically produced hazes provide a possible explanation for aerosol features in the transmission spectra of many hot Jupiters, especially those with relatively low equilibrium temperatures. Recent simulations of photochemical hazes as passive tracers in a 3D general circulation model demonstrate that the distribution of hazes can be highly inhomogeneous, with horizontal abundance variations of over an order of magnitude. At the same time, one-dimensional radiative transfer models show that absorption and scattering by hazes can change the atmospheric temperature profile by several hundred Kelvin. The additional heating and cooling have the potential to significantly affect atmospheric circulation. In this talk, we present new GCM simulations of hot Jupiter HD 189733b that include radiative feedback from hazes. A focus will be on changes in the atmospheric temperature structure and circulation. We will then compare the 3D haze distribution from previous simulations with radiatively passive hazes to the new haze distribution in simulations that include haze radiative feedback. Finally, we predict transit spectra based on the simulations and compare them to observations.