SPECTROSCOPY FOR HOT SUPER-EARTH EXOPLANETS

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Spectroscopic observations of exoplanets are now possible by transit methods and direct emission. Spectroscopic requirements for exoplanet atmospheres will be reviewed based on existing measurements and model predictions for hot Jupiters and super-Earths. Super-Earths are exoplanets with masses in the range of about 2 to 10 Earth masses (i.e., between the size of Earth and Neptune). Many of them have very short orbital periods like hot Jupiters and are also hot because of proximity to their parent star. For example, Kepler-10b has a mass of 4.54 times that of Earth, a density of 8.74 g cm^{-3} and a surface temperature of 1833 K. More than thirty super-Earths have been discovered and the most interesting objects are rocky planets such as Kepler-10b and CoRoT-7b. Schaefer *et al.* have calculated the chemical equilibrium composition of super-Earths with temperatures in the range 500-4000 K based on the vaporization of silicate rocks similar to those of the Earth's continental crust and bulk silicate Earth. In addition to H_2O, CO_2, CH_4, CO and H_2 found in hot Jupiters, additional species such as SO_2, O_2, HCl, HF, NaCl, KCl, KF, KOH and NaOH are expected to be present. Similar to our previous work on hot ammonia[a] and hot methane[b], emission spectra of hot SO_2 will be presented. Continuing work on NaCl and KCl emission spectra will also be covered.

[a] Hargreaves, R. J., Li, G., and Bernath, P. F. 2011, Hot NH_3 Spectra for Astrophysical Applications, *Astrophys. J.* **735**, 111.

[b] Hargreaves, R. J., *et al.* 2012, Hot Methane Line Lists for Exoplanet and Brown Dwarf Atmospheres, *Astrophys. J.* **757**, 46.