FILLING A CRITICAL GAP IN THE PRESSURE-BROADENING DATA NEEDED FOR MODELING SUPER-EARTHS AND NEPTUNIAN ATMOSPHERES

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One of the key findings regarding exoplanet science is that majority of the detected close-in planets from Kepler fall within the super-Earth/sub-Neptune regime 1–3.5 Earth Radii. Planet formation models of these systems suggest broad compositional diversity in this radius regime, with a high likelihood for large atmospheric metal content 100-1000xSolar. Our ability to unlock the mysteries of this new class of planet hinges on our ability to link the spectral observations to theoretical models, and then our ability to link those models to fundamental molecular and atomic opacities. However, there is a critical lack of data that is required to compute opacities and the subsequent theoretical atmosphere for high-metallicity atmospheres. This is because high-metallicity atmospheres are expected to contain larger fractional quantities of H_2O, CO, CO_2, and CH_4, relative to H_2-dominated systems that have been the focus of the majority of previous observing campaigns. Therefore, they require fundamentally different pressure-broadening parameters that are currently lacking. Nevertheless, ignoring the impact of these parameters will lead to errors in the calculation of the planet's energy budget, as well as errors in the ultimate atmospheric spectra. We will present an overview of our team's efforts to fill this gap by computing the theoretical broadening coefficients relevant to the super-Earth to sub-Neptune temperature range. The importance of these results will be discussed and their impact on exoplanet radiative transfer modeling of objects from space-based telescopes will be discussed.