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Retrieval of Atmospheric Structure and Composition of Brown Dwarfs

Brown dwarfs are free-floating objects with similar properties to gas giant exoplanets, such as their radius and atmospheric composition. One of the main benefits of brown dwarf research is that their free-floating nature allows a much higher signal-to-noise ratio than their exoplanet counterparts. Thus, the high resolution spectra of brown dwarfs present the perfect testing bed for exoplanetary atmospheric physics and high-temperature molecular line lists. My thesis research is on the retrieval of atmospheric structure and composition of brown dwarfs using optimal estimation techniques. I have investigated the importance of high-temperature molecular line lists and the parameterisations of line opacity with H₂-He-dominated atmospheric pressure-broadening. My findings indicate that pressure-broadening makes a large difference to the retrieved spectra when compared to ignoring pressure-broadening altogether. We therefore highly recommend using the appropriate pressure-broadening parameters for atmospheric retrievals on brown dwarfs.