Invited Lecture

THE RESONANCE LINES OF SODIUM AND POTASSIUM IN BROWN DWARF SPECTRA

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The cool atmospheres of brown dwarfs are characterised by the formation of molecules and condensates. The highly wavelength dependent opacity of abundant molecules such as water, methane and ammonia dominate the infrared spectra of these substellar objects, while at shorter wavelengths the spectrum is shaped by the neutral alkali metals as more refractory elements are sequestered in condensate species. In particular the sodium and potassium resonance doublets, centered at 0.59 and 0.77 μm respectively, play a unique role in shaping the spectrum between 0.4-1.0 μm as the high atmospheric densities of H_2 ($<10^{21}$ cm^{-3}) and He collisionally broaden these lines up to $\pm$ 3000 cm^{-3} from the line centre. Using our state-of-the-art 1D radiative-convective equilibrium model ATMO, we are developing a grid of model substellar atmospheres and investigating the impact of Na and K line shapes on predicted brown dwarf spectra. We find that there are large differences between published line shape calculations and this can affect the predicted spectra. Most notably these uncertainties occur in the near-infrared due to the extent of the redwing of the K resonance lines.

New calculations of the alkali line shapes are in progress and will be presented at the conference.