Atmosphere models for cool brown dwarfs and giant exoplanets

Mark Phillips,[1] *University of Exeter*

The study of brown dwarfs and giant exoplanets is rapidly evolving as ever-improving instrumentation becomes sensitive to cooler objects. Accurate and reliable atmosphere and evolutionary models are important for placing mass and age constraints on newly discovered objects, and understanding the rich chemistry and physics taking place in their atmospheres. We are expanding on the widely used COND evolutionary models by developing a grid of model atmospheres (T_{eff}=200-2000K, log(g)=2.5-5.5) with our state-of-the-art 1D radiative-convective equilibrium code ATMO. ATMO includes the latest opacities for important molecular absorbers such as H_2O, CH_4 and NH_3, and takes into account the condensation of H_2O and NH_3 which are important for the coolest atmospheres (T_{eff}=200-350K). These model improvements allow us to follow the evolution of Jupiter mass objects down to the coolest temperatures (T_{eff}=200K). I will present comparisons of these new models to previous model grids and to observations in colour-magnitude diagrams. I will also highlight the uncertainty surrounding the highly pressure broadened potassium resonance doublet, the treatment of condensates through rainout, and the calculation of low temperature chemical equilibrium abundances. Our future work will involve expanding on this initial grid, to investigate the effects of metallicity, C/O ratio and non-equilibrium chemistry in cool brown dwarfs and giant exoplanets.

[1] mp537@exeter.ac.uk