Monday Morning

Characterising Young Giant Exoplanet Atmospheres with Direct Imaging

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Direct imaging uniquely yields photons from the atmospheres of wide giant exoplanets (>10 AU separation), enabling measurement of atmospheric properties and opening up a new realm of characterization possibilities. Currently, ∼10 young (<100 Myr), massive planets (>1 M_{Jup}) planets have been directly imaged within 100 AU of their stellar primary. These objects are detectable at near- and mid-infrared wavelengths (1-5 μm) due their own self-luminosity – at such young ages they are still hot and bright compared to similar mass objects at solar system ages. Most young giant exoplanet atmospheres are redder than brown dwarfs with similar $T_{\rm eff}$. This is likely an effect of the low surface gravity of these atmospheres, potentially allowing them to retain silicate clouds down to cooler temperatures and preferentially driving non-equilibrium chemistry in these atmospheres. Young exoplanets may also be significantly variable – multiple low-surface gravity late-L objects (PSO J318.5-22, 2M2244, W0047) that are close spectral matches to young imaged planets show high amplitude (7-10%) variability. I will discuss both current progress and the future potential for characterising giant exoplanet atmospheres via direct spectroscopy and variability monitoring. As new instruments and technologies press down to tighter separations and higher contrasts, the number of directly imaged exoplanets will likely increase dramatically, allowing us to probe both cooler atmospheres via spectroscopy as well as the statistics of planets with similar orbital separations as the gas giants in our own solar system (5-20 AU).

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