Mapping brown dwarfs by combining high spectral observations with Ariel lightcurves

Benjamin Charnay, Sam de Reg, Matthieu Ravet, Lucas Teinturier, Flavien Kiefer, Gaël Chauvin, Allan Denis, Mickaël Bonnefoy, Paulina Palma-Bifani, Alice Radcliffe, Arthur Vigan

Brown dwarfs are massive analogues of extrasolar giant planets. Compared to exoplanets whose observations are generally limited by the presence of their bright host star, brown dwarfs are ideal targets for studying substellar atmospheric physics, chemistry and dynamics. We will introduce a new method - Differential Molecular Rotational Broadening - which consists in comparing the apparent rotational broadening of individual molecules from high-resolution spectra. Application of this approach to VLT-CRIRES observations for different molecules (CO, H2O, CH4 and NH3) in the atmosphere of the brown dwarf DENIS J0255-4700 reveal the existence of latitudinal chemical variations, likely due to an equatorial cloud belt. We will discuss after the interest of combining of high-resolution ground-based observations with Ariel lightcurves to map longitudinal and latitudinal variations in brown dwarf atmospheres.