

## Atmospheric models for young giant planets and brown dwarfs

Benjamin Charnay (1), Bruno Bézard (1) & Jean-Loup Baudino (2)

(1) LESIA, Observatoire de Paris, PSL, Meudon, France, (2) Oxford University, Oxford, UK

### Abstract

Exo-REM is 1D radiative-convective model developed for atmospheres of young giant planets and brown dwarfs [1, 2]. It takes into account non-equilibrium chemistry and a physical and self-consistent cloud model. This model successfully reproduces the observed photometry and spectra of brown dwarfs and young giant exoplanets. In particular, it reproduces the L–T transition for brown dwarfs, the reddening observed for low-gravity objects and the methane depletion observed on young exoplanets [2].

Using Exo-REM, we produced grids of atmospheric models for young giant planets and brown dwarfs for a range of effective temperature, gravity, metallicity and C/O at low ( $R \sim 300$ ), medium ( $R \sim 3000$ ) and high ( $R \sim 30000$ ) spectral resolution using Exo-REM. These grids will be freely accessible to the community.

Finally, we will present applications of these grids to recent GRAVITY and SINFONI observations of young giant exoplanets [3,4].

### References

- [1] Baudino et al., “Interpreting the photometry and spectroscopy of directly imaged planets: a new atmospheric model applied to beta Pictoris b and SPHERE observations”, *A&A*, 2015
- [2] Charnay et al., “A Self-consistent Cloud Model for Brown Dwarfs and Young Giant Exoplanets: Comparison with Photometric and Spectroscopic Observations”, *ApJ*, 2018
- [3] Lacour et al., “First direct detection of an exoplanet by optical interferometry Astrometry and K-band spectroscopy of HR 8799 e”, *A&A*, 2019
- [4] Hoeijmaker et al., “Medium-resolution integral-field spectroscopy for high-contrast exoplanet imaging: Molecule maps of the beta Pictoris system with SINFONI”, *A&A*, 2018