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Atmospheric characterisation of Gaia ultra-cool dwarfs

T. Ravinet[1], C. Reylé[1], A. J. Burgasser[2], R. L. Smart[3], N. Lagarde[4], and J. G. Fernández-Trincado[5]

[1] Université de Franche-Comté, Institut UTINAM, CNRS UMR6213, OSU THETA Franche-Comté-Bourgogne, Observatoire de Besançon, BP 1615, 25010 Besançon Cedex, France

[2] Center for Astrophysics and Space Science, University of California San Diego, La Jolla, CA 92093, USA

[3] Instituto Nazionale di Astrofisica, Osservatorio Astrofisico di Torino, Strada Osservatorio 20, I-10025 Pino Torinese, Italy

[4] Laboratoire d'Astrophysique de Bordeaux, Université Bordeaux, CNRS, B18N, Allée Geoffroy Saint-Hilaire, 33615 Pessac, France

[5] Instituto de Astronomía, Universidad Católica del Norte, Av. Angamos 0610, Antofagasta, Chile

Abstract. The exquisite *Gaia* data offer a new way to detect ultra-cool dwarfs (UCDs) at the stellar / substellar transition. Their spectroscopic follow-up permits constraining their properties, such as their spectral types and their peculiarities. Using atmosphere models, we can retrieve their characteristics. It also allows us to verify how well the atmosphere models reproduce UCD near-infrared spectra.

We retrieved the atmospheric properties of a homogeneous set of low-resolution near-infrared spectra from objects across the star/brown dwarf boundary, using four different atmosphere models. When comparing the parameters obtained from various models, we identify systematic discrepancies. Effective temperatures follow previously derived $T_{\rm eff}-$ spectral types relations, but gravity and metallicity determinations are not very robust. Radii of the UCDs become accessible thanks to *Gaia*-derived distances, and are on average smaller than what was expected from evolutionary models.

We observe that atmospheric models still struggle reproducing the near-infrared pseudo-continuum of ultra-cool dwarfs, particularly at the M/L transition. It is likely due to the apparition of dust and clouds in the atmospheres, which modeling prescription still have to be improved. Introducing an ad-hoc correction enhances the fit quality, yet yields non-physical results.

Given the differences between models, we conclude that properties of UCDs derived from the near- infrared must be taken with care. Ultra-cool dwarf photospheres regulate their cooling and have an impact on evolutionary models, and a revised description would improve our understanding of these objects.