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WEATHER ON OTHER WORLDS: BD VARIABILITY AND THE VVV

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Various evidences point to the presence of clouds in ultra-cool atmospheres. An important ambiguity remains as to whether all variability in ultra-cool dwarfs is caused by patchy clouds, or other fenomena like magnetic activity and auroras. Simultaneous multi-wavelength photometric and/or spectroscopic monitoring could help to reveal this enigma.

Patchy clouds on Ultra Cool Dwarfs should cause rotationally modulated photometric variability due to flux differences between the most-cloudy and least-cloudy hemispheres. Numerous searches for variability in L and T dwarfs have been performed to date. Artigau et al. (2009) were the first to detect highly significant, periodic (P = 2.4 h, ΔJ=50 mmag) variations in a cool brown dwarf (SIMP J01365; T2.5). Radigan et al. (2012) reported that a simple model consisting of cloudy and cloud-free surface patches cannot reproduce the color-variability observed in 2MASS 2139.

Cloud models (Marley et al. 2002) successfully explain key features of the L/T transition (Burgasser et al. 2002). Photometric variability in the 3-5μm region is not restricted to the L/T transition (Heinze et al. 2013). It looks like many L and T dwarfs are variable, regardless of spectral type. The photometric variability at different wavelengths is caused by different kind of clouds. In order to have a complete picture of what causes the variability, a complex photometric and spectroscopic study from optical to mid-infrared wavelengths is needed. Here we present the first results of a NIR photometric follow-up of 2MASS 1507-1627 — a L5 brown dwarf located about 7.3 pc from the Sun, target of a Spitzer exploration program (PI Metchev). The very dense cadence of 6600 points covering two full consecutive periods is presented on Fig. 1. The LK (Lafler & Kinman 1965) method reveals a clear period of 0.10140±0.0001days (2.433±0.024 hours) in full agreement with MIR Spitzer observations.

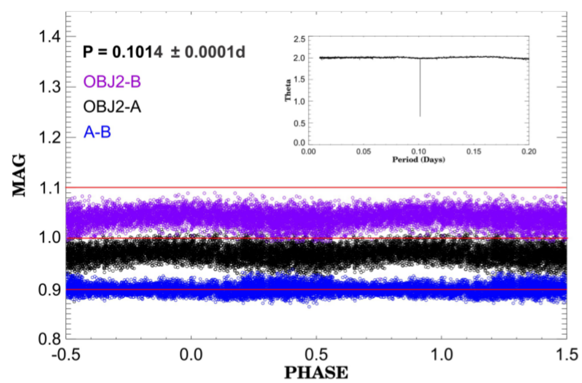

Fig. 1. Light curve of 2MASS 1507-1627.

Future simultaneous optical and NIR spectral monitoring of the brightest brown dwarfs covering as many as possible rotational periods will give us the tool, able to determine exactly how the variability is expressed in their spectral energy distribution. The long-term monitoring of the variability is also very important. The Vista Variables en Vía Láctea NIR Survey (Minniti et al. 2010) could give us an opportunity to do this. The advantages of the VVV are: good PM and parallax information for the targets; long term (> 6 years) time coverage ($\geq$ 70-80 epochs); many suitable comparison stars; and 1% photometric accuracy for the relatively bright (K_S~12-15 mag) objects. There are also important disadvantages: not enough dense observational sequence; not enough photometric accuracy for the fainter targets; the variability survey is in K_S filter — not the best for the BD variability.

REFERENCES

Artigau, É., at. 2009, ApJ, 701, 1534
Burgasser, A. J., et al. 2002, ApJ, 571, L151
Heinze, A. N., et al. 2013, ApJ, 767, 173
Lafler, J. & Kinman, T. D. 1965, ApJS, 11, 216
Marley, M. S., et al. 2002, ApJ, 568, 335
Minniti, D. et al. 2010, New Astronomy, 15, 433
Radigan, J., et al. 2012, ApJ, 750, 105

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