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Mid-Infrared Variability in Binary Brown Dwarfs

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Abstract. We have spatially resolved several nearby binary brown dwarfs and obtained mid-infrared photometry with VISIR at the VLT. In particular, we have monitored ε Indi B and HD 130948 in several narrow-band MIR filters. The 10.5μm band is a probe to constrain non-equilibrium chemistry in the atmosphere of cool brown dwarfs.

Keywords. stars: low-mass, brown dwarfs; binaries: close

1. Ground-based MIR measurements

Ground-based mid-IR imaging of binary brown dwarf systems with sub-arcsecond spatial resolution can complement high sensitivity, but low-spatial resolution space-based photometry as obtained e.g. with *Spitzer*. The spatially resolved photometry of the close (seperation 0.7") brown dwarf binary ε Indi Ba and Bb (Sterzik, Pantin, Hartung *et al.* 2005) and of three other brown dwarfs in binary systems, GJ 229 B (separation 7.8"), HD 130948 B (separation 2.6", B itself a L4 binary with a separation of 0.1") and HR 7329 B (separation 4.2") allows to constrain atmospheric models of ultra-cool brown dwarfs of various ages and metallicities (Geißler, Chauvin and Sterzik 2008). On-source integration times of about one hour in the 8.6μm, 10.5μm and 11.3μm bandpasses yield 3σ detection sensitivities of less then 1-2 mJy for point sources. In case of the HD 130948 B, we have noticed a flux variation of at least 1.7$\pm$0.6mJy within 48 hours in the 10.5μm bandpass and could not explain it through insufficient sensitivity during one epoch of observations. Therefore we conducted time-series measurements in order to probe potential variability. In particular, significant variations in the 10.5μm band may be expected in the atmospheres of brown dwarfs at the L/T transition in case non-equilibrium chemistry affecting the CO, CH_4 and NH_3 abundances is important (Hubeny and Burrows 2007). While in the case of HD 130948 B the likelihood of variability is small (Geißler *et al.* 2009), ε Indi Ba (a L/T transition object) may be variable in 10.5μm.

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