A study of the absorption features of Makemake

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Most transneptunian objects do not show prominent absorption features due to the size and location [1]. Nevertheless, absorption due to water ice and volatile ices do appear on a few large objects, particularly those that have good signal-to-noise-ratio spectra. In particular, methane appears in three dwarf planets (Pluto, Eris, and Makemake), as well as in some smaller objects, such as Quaoar and probably Sedna, and in Neptune's satellite Triton.

Methane has such intense absorption features that even small amounts of methane on the surface dominate the reflectance spectra in the visible and near-infrared range, making it a great tool to probe surfaces, especially, considering that the depth of the bands could be used as a proxy for physical depths and that shifts in the bands with respect to laboratory measurements could point to possible dilutions (as seen in Pluto and Eris; for instance [3] and references therein).

Aiming at gaining a deeper insight into Makemake's surface through its methane absorption bands, we have observed it with X-Shooter at the VLT with a medium spectral resolution in the range of 0.4–1.8 microns. In this work, we present the results of comparing these features with those of methane in the laboratory and the same features in Eris and Pluto, within the context of methane-dominated spectra of dwarf planets.

References: [1] Schaller, E.L., Brown, M.E., 2007, Astron. J., 659, L61. [2] Barucci, M.A., et al., 2011, Icarus, 214, 297. [3] Alvarez-Candal, A., et al., 2011, Astron. Astroph., 532, A130.