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0.1 Resolved spectral observations of 1 Ceres

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1 Ceres has been observed during the oppositions of January 2004 and May 2005 with the NACO adaptive optics system on the VLT. Both imaging and spectroscopy were performed in the 0.9-4.1 μm range. Extensive longitudinal coverage was acquired in imaging mode with spatial resolution up to 50 km, confirming the presence of faint dark and bright markings at the surface and color variations in the NIR ([1]), previously observed in the UV ([2]) and NIR (Carry et al., submitted).

The first resolved spectra of Ceres have also been acquired during these runs. The data consist in spectral scans of the day side, typically with 15 lines of 20 samples and a spectral resolution R$\sim$500. A specific calibration scheme has been applied to preprocess the data and to evidence small compositional variations at the surface of Ceres. Spectral analysis suggests minimal amount of ferrous silicates, or their presence in very small grains only. The major signatures are two bands centered at 3.06 and 3.30 μm, which exhibit significant spatial variations at this scale (5 to 10%). These features are best fit by ammoniated minerals (phyllosilicates or feldspars), although the lack of secondary hydration bands seems to rule out phyllosilicates. No presence of ices (H2O, C02...) is detected, even at the poles. Altogether, this is very different from spectral features observed e.g. on irregular satellites of Saturn. If Ceres was once rich in ices (e.g., [3]), this suggests a global resurfacing with melting of ices in the subsurface, and alteration under the influence of H2O and perhaps NH3, with reduced production of phyllosilicates.

Study based on observations collected at the European Southern Observatory, Chile, ESO N˚ 072.C-00092 and 075.C-0329.

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