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Spectroscopic study of Ceres' collisional family candidate members: taxonomic classification and comparison to Ceres' surface.

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Despite the observed signs of large impacts on the surface of Ceres, there is no confirmed collisional family associated with this dwarf planet. Carruba et al. (2016) carried out a dynamical study in the ‘pristine region’ of the main asteroid belt and proposed a sample of 156 asteroids as candidates to be members of a Ceres’ collisional family. Our main objective in this work is to study the spectral link between Ceres and a total of 14 observed asteroids among the family candidate samples proposed by Carruba et al. (2016) to explore their potential membership to the collisional family.

For this aim we obtained visible spectra of these 14 asteroids using the OSIRIS spectrograph at the 10.4m Gran Telescopio de Canarias (GTC), located at the El Roque de los Muchachos Observatory (La Palma, Spain), managed by the Instituto de Astrofísica de Canarias (IAC). We reduced the raw images and extracted the spectra with a semi-automatic Python-based pipeline. After that, we computed spectral slopes in two different wavelength ranges: one in the visible (490-800 nm) and one in the visible-near-infrared (800-920 nm) to compare the obtained values with those in Ceres’ surface already Ncomputed by Rousseau et al. (2020) using the spectrometer onboard the NASA Dawn spacecraft.

We present the spectra and the taxonomy of 14 observed asteroids, their taxonomy, and calculated slopes. We concluded that only one asteroid could be compatible with an origin in a primitive collision at Ceres. We have also found a hydration band at 700 nm, also found in the surroundings of crater Occattor (Rizos et al. 2019). On the other hand, we have also found a relation between the spectral slope of the craters in Ceres’ surface and their age in both wavelength ranges. This behavior could be related to space weathering.

Exploring the sample as a whole, the variability in member’s taxonomy and the differences in their spectral slopes makes us conclude that they cannot be considered as members of a collisional family of Ceres. However, the presence of a hydration band in one of the asteroids could be proof that such a family may have existed.

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