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Empirical photometric correction on VIR-Dawn data for Ceres

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The NASA's Dawn mission has just been inserted in the orbit of the (1) Ceres asteroids, allowing obtaining the first resolved images and spectra of the asteroid.
An important operation to perform on these data is the photometric correction, aimed at removing the trend of reflectance with incidence, emission and phase angle. This not only is a fundamental process of data reduction (since makes it possible to compare observations taken at different illumination and viewing angles), but also allows the study of physical and optical properties of the asteroid surface, which drive the reflectance vs illumination angles behavior, such as regolith grain size, surface roughness, presence of contaminants, role of multiple and single scattering.
We applied an empirical photometric correction on Ceres data provided by the Visible and Infrared (VIR) mapping spectrometer on board Dawn. This approach is based on a statistical analysis of the whole dataset, does not need the assumption of theoretical photometric models and can be very helpful in studying the photometric behavior of spectral parameters, such as band depths or slope.

The empirical photometric correction was already applied on Vesta data provided by VIR. Ten brightness families were defined by a statistical analysis and for each family the photometric behavior of reflectance and other spectral parameters has been studied. The results showed that the variation of reflectance and absorption band depth with phase is much less evident in brighter regions of Vesta rather than the darker ones. This has been ascribed to the more important role of multiple scattering on brighter regions, which redistributes the incoming radiation at all the phase angles.

Results obtained on Ceres are still preliminary, due to the paucity of data collected so far, relative to the Approach phase, only.
However, these results suggest a similar reflectance-phase angle behavior for reflectance at different wavelengths in the visible range (0.55 mm, 0.75 mm, 0.85 mm). This would be consistent with what observed on other asteroid, where the steepness of photometric curve is almost constant through visible spectrum, except at wavelengths contained in absorption bands.
A confirmation of these results can be obtained by considering in the data at better spatial resolution that will be obtained during the Dawn orbit on Ceres.