

Phase- and color-ratio implementation results applying to dwarf planet Ceres and asteroid 4 Vesta surfaces

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“The phase-ratio method as well as color-ratio imagery was commonly used to identify structural changes of the upper regolith layer of the lunar surface, especially in the spacecraft landing sites. In the present it's possible to implement these methods to images of other planetary bodies due to extending number of space missions intended to provide remote sensing of planetary surfaces. Such opportunity is available for exploration of dwarf planet Ceres and asteroid 4 Vesta due to data obtained during NASA Dawn space mission. A large number of high-resolution images under various illumination and observation conditions reveals applying the method to both the biggest bodies in the main belt.

In our study we used Level 1b images obtained by instrument Framing Camera (FC) during HAMO and LAMO orbital phases. All images that were used in the research meet the main selection criteria.

In order to find areas that demonstrate an anomalous optical roughness several the most prominent regions on Ceres and Vesta surface were selected. Two regions on Ceres are small (up to 9 km in diameter) craters Xevioso and Oxo, both exhibiting bright material ejecta around their rim. Other two are Ahuna Mons (elliptical elevation with flat summit about 4 km in height) and Occator crater (D=90km) and also considered to bear the same bright material like the previous regions. On Vesta surface were selected regions around three craters (Vibidia, Laelia and Laeta) and one tholus (Aricia Tholus), within which are evidences of low-albedo material presence. Such material is usually associated with ejecta blankets around the crater and assumed to be exogenic.

For each region maps of phase- and color-ratio distribution were obtained. We obtained color ratios $C(438\text{nm}/749\text{nm})$ and $C(749\text{nm}/917\text{nm})$ for vestan regions and $C(438\text{nm}/749\text{nm})$ and $C(749\text{nm}/965\text{nm})$ for Ceres surface regions. Comparing phase-ratio distribution images with apparent albedo and color-ratio images provides an opportunity to find areas with anomalous optical roughness and chemical variations. Some of the results will be discussed during the meeting.

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