Geophysical Research Abstracts
Vol. 18, EGU2016-17302, 2016
EGU General Assembly 2016

Spectrophotometric Modeling and Mapping of Ceres

Jian-Yang Li (1), Lucille Le Corre (1), Vishnu Reddy (1), Andreas Nathues (2), Martin Hoffmann (2), Michael Schaefer (2), Mauro Ciarniello (3), Stefano Mottola (4), Stefan E. Schröder (4), Carol A. Raymond (5), and Christopher T. Russell (6)

(1) Planetary Science Institute, Tucson, United States (jyli@psi.edu), (2) Max Planck Institute for Solar System Research, Germany, (3) Instituto di Astrofisica e Planetologia Spaziali, Instituto Nazionale di Astrofisica, Italy, (4) DLR, Germany, (5) Jet Propulsion Laboratory, California Institute of Technology, United States, (6) IGPP, University of California Los Angeles, United States

During the rendezvous with Ceres, Dawn Framing Camera (FC) collected images covering a wide range of illumination and viewing geometries of the surface of this inner most dwarf planet through seven color filters from 440 nm to 980 nm and a panchromatic filter. This dataset enables a comprehensive study of the photometric properties of Ceres. Although the overall albedo variation on Ceres is about 15%, many regions 10s km in size or smaller have geometric albedos up to 0.5. The geology on Ceres is highly complex under its highly uncertain and unusual mineralogical composition and water ice content based on the current understanding. The detailed mapping of the photometric properties across the whole surface of Ceres could therefore potentially reveals clues about the composition and geologic processes acting on the surface. Such maps could also be used to perform photometric corrections to imaging data to produce seamless mosaics. The objective of this work is to derive the globally averaged photometric parameters, as well as maps of the fundamental photometric properties of Ceres over all colors covered by the Dawn FC, including albedo, phase function, and roughness.

For photometric modeling, we adopted a version of Hapke model, and a Lommel-Seeliger model with a linear-exponential phase function. The globally averaged geometric albedo of Ceres is 0.085±0.005, with a weak dependence on wavelength mimicking Ceres' spectrum. The photometric roughness is 21°±2°, independent of wavelength. The phase function of Ceres shows a slight trend with wavelengths, with decreasing backscattering towards longer wavelength, consistent with phase reddening as previously observed from the ground. Our data do not cover sufficiently small phase angles to allow us to model the opposition parameters. But an estimate of B0=1.77 for the amplitude of opposition and h=0.15 for the width appears to be reasonable.

We will also reports the results about photometric property mapping. The mapping is performed by subdividing the surface into longitude-latitude grid of 0.5°-1° wide, and applying separate photometric modeling to the grid. We expect to generate maps of photometric parameters, compare it with the maps generated with photometric corrections using the global average photometric parameters, and interpret these maps in the context of mineralogy and geology.