Geophysical Research Abstracts
Vol. 20, EGU2018-19738, 2018
EGU General Assembly 2018

Challenges for Hapke modeling of asteroid reflectance spectra in the mid-infrared range

Manuel Silva (1), Teresa Seixas (1,2), Pavlo Sazonov (2), Alessandro Maturilli (3), and Jörn Helbert (3)

(1) Department of Physics and Astronomy, Faculty of Science, University of Porto, Portugal, (2) Center for Earth and Space Research of University of Coimbra (CITEUC), Portugal, (3) Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany

Hapke's radiative transfer theory provides a complete framework for modeling bi-directional reflectance (BDR) spectra of minerals and intimate mixtures of minerals, as those forming asteroidal regoliths. There are, however, some factors that may render questionable the use of Hapke's model to retrieve grain size and abundance of each component mineral from BDR spectra. In particular, the assumption of a wavelength-independent phase function, which has been routinely used for BDR spectra in the UV-VIS-NIR range, is still to be tested in a wider wavelength range. This is an absolute requirement because dramatic changes in light absorption and scattering are likely to occur near anomalies in the refraction index in the mid-infrared (MIR) range.

We performed BDR spectroscopy measurements on single mineral assemblages of olivine (OL) and augite (AUG) minerals in the wavelength range 0.3-18 mm and for several phase angles. The measured spectra, which show evidence for a wavelength-dependent phase function, were fitted using Happke's model with phase functions of Legendre and Henyey-Greenstein types with variable coefficients. It is found that fitting the quasi-isotropic scattering features and the inversion of radiance vs phase angle monotonicity, which are observed both OL and AUG assemblages, requires modeling the phase function with Legendre polynomials of order 5, at least; moreover, the coefficients of these polynomials depend linearly on wavelength. We present the results of this analysis and its consequences for Hapke's modeling of asteroid reflectance spectra in the MIR range.