Geophysical Research Abstracts
Vol. 15, EGU2013-6199-3, 2013
EGU General Assembly 2013

Progress in Polarimetric Modeling of Comet Dust Based on its Mechanical Characteristics

Lioudmila Kolokolova (1), Yuri Skorov (2), Jürgen Blum (2), and Heinrich Schmidt (2)

(1) University of Maryland, Department of Astronomy, College Park, United States (ludmilla@astro.umd.edu), (2) Institute for Geophysics and Extraterrestrial Physics, Technical University of Braunschweig, D-38106 Braunschweig, Germany

Model of comet dust as aggregates of submicron particles (monomers) has proved its reliability by providing a good qualitative fit to the observational data in the visible, near- and thermal infrared. Especially sensitive to the dust properties appeared to be polarization of the scattered light. It provides helpful information concerning structural characteristics of aggregates especially if we combine polarimetric data in the visible and near-infrared. Using Multiple Sphere T-Matrix code (MSTM)by Mackowski and Mishchenko (JQSRT, 112, 2182, 2011) we simulated light scattering by ballistic particle-cluster (BPCA) and cluster-cluster (BCCA) aggregates. It was found that the dependence of polarization on phase angle and wavelength changes significantly at changes in aggregate porosity and size. Comparison with the cometary observations allowed narrowing down the range of porosity of comet dust particles. It was shown that in the case of aggregates made of identical spherical monomers a better fit to the observational data can be achieved if we consider aggregates with the porosity intermediate between the porosity of BPCA and BCCA. In this study we explore aggregates of such an intermediate porosity, modeling them as aggregates of polydisperse monomers or as hierarchic aggregates, i.e. particles resulted from agglomeration of small aggregates. These aggregates have been proved to be a good model to reproduce tensile strength of upper layers of cometary nucleus. Their light-scattering, specifically polarimetric, characteristics reveal porosity and structure of the near-nuclear cometary dust. This, in turn, can shed light on the formation of comets.