New techniques for computer modeling of light scattering by the dust layers on cosmic bodies

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The talk will present two techniques that allow modeling characteristics of the scattered light on such cosmic bodies as Moon, Mercury, asteroids and atmosphereless planetary moons. One of them, called PWPP (Plane Wave Plane Parallel) technique, is a solution of the Maxwell equations for a randomly distributed particles in the 2D infinite layer of a given thickness. It was developed by Daniel Mackowski (see Mackowski, D. and Ramezanpour, B., 2018, JQSRT, 213, 95-106; and other recent papers of those authors) and tested by comparison with the radiative transfer and T-matrix results. The other one is a further development of the radiative transfer theory with application to densely packed media using static structure factor correction. Although this approach was developed some years ago (see Mishchenko, M., 1994, JQSRT, 52, 95-110), it has been recently updated by Gen Ito et al. (2018, JGR, 123, 1203-1220) to allow considering aggregates as the elements of the media. The talk will describe both approaches, their advantages and shortages, and show the results obtained with them for the spectra of icy satellites of Saturn acquired by the VIMS Cassini instrument and for the photometry of the nucleus of comet 67P/ Churyumov-Gerasimenko studied by the Rosetta OLSIRIS instrument. Fitting the observational data with the computations allowed estimations of the regolith particle size and composition as well as the porosity of the surface layer. This work has been supported by the NASA Solar System Workings grant.