Using wavelength dependence of the opposition effect to characterize regolith dust particles

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In this presentation I consider two opportunities to characterize regolith dust particles using the opposition effect: (1) through the wavelength variations in the steepness and width of the photometric opposition surge and (2) through the variations in absorption bands at small phase angles. The first effect is discussed using Rosetta OSIRIS data for asteroids Steins and Lutetia acquired in several filters. The second effect is studied using Cassini VIMS data for Saturnian satellites. I show that the behavior of asteroid Steins' opposition surge is consistent with coherent backscattering effect whereas asteroid Lutetia shows the photometric behavior that cannot be described either by coherent backscattering or by shadow hiding. The difference in the regolith particles of these two asteroids is considered and models of dust particles for both cases are suggested. The second effect is illustrated by the VIMS spectra of Dione and Rhea. It is shown that the depth of the absorption bands in their spectra varies with phase angle, and these variations can be explained by influence of the coherent backscattering effect. Modeling of this effect for the 2-micron ice band allows estimating the size of particles and porosity of the regolith.