Asteroids without opposition effect

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Most of the observed asteroids show a nonlinear increase of brightness at small phase angles, typically less than 7°, known as the opposition effect. Its amplitude, relative to the extrapolation of the linear part of the phase curve, depends on an asteroid's albedo, decreasing for low-albedo asteroids (e.g., Belskaya and Shevchenko 2000). Recently, low-albedo asteroids without the nonlinear increase of brightness down to subdegree phase angles were observed among outer-belt asteroids and Jupiter Trojans (Shevchenko et al. 2012, 2013). These asteroids belong mainly to the P and D spectral classes that have featureless spectra with moderate to high slopes in the visual and near-infrared wavelengths (DeMeo et al. 2009, 2013). Their spectra are similar to the spectra of carbonaceous chondrite meteorites, in particular, to those of some CI meteorites (Alais, Tagish Lake) and some CM meteorites after thermal heating (Cloutis et al. 2011, 2012, Fornazier et al. 2011).

We analyze possible relationships between surface composition of asteroids and their opposition effect behavior. Asteroids which do not show nonlinear opposition effect in their magnitude–phase angle dependencies tend to have very low surface albedos. However, the correlation is not very strong due to errors in asteroid albedo determinations. We note that the absolute magnitudes of these asteroids determined using the H,G function are systematically overestimated (Slyusarev et al. 2012, Shevchenko et al. 2014). An overestimate of the absolute brightness results in systematic overestimation of their albedos from the infrared data (Usui et al., 2011, Masiero et al., 2011). Advantages of using the new H,G_1,G_2 function (Muinonen et al. 2010) for the determination of asteroid absolute magnitudes are discussed.

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