# The comparison of the photometric properties of comet 9P/Tempel 1 with other asteroids and comets

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We compare the photometric properties of comet 9P/Tempel 1, as modeled from both approach images and disk-resolved images returned by Deep Impact (DI), with other comets and dark asteroids. The phase function constructed by combining the extracted nucleus from approach images, the encounter images, and the lookback images, suggests a phase coefficient $\beta$ of about 0.050 to 0.055 mag/deg. An asymmetry factor of about -0.55 is indicated for the single-particle phase function. Comparing with the phase functions of other comets and asteroid (253) Mathilde, Tempel 1 has a relatively steep phase function, suggesting relatively strong backscattering. The visible spectrum of Tempel 1 is featureless and linear with a red slope of $12\pm2$%, in the middle of the range for comets. The Hapke's modeling results in a single-scattering albedo (SSA) of $0.043\pm0.008$ at 550 nm, and a linear SSA spectrum similar to its disk-integrated spectrum. The value of the SSA of Tempel 1 is very close to the most common value quoted for comets and dark asteroids. The global photometric roughness parameter of $16^\circ$ as found from disk-resolved analysis is similar to most comets and asteroids that we know of. The subtle albedo variations of only 12%, and color variations of only 3% suggest a very uniform surface, very different from the surface of comet 19P/Borrelly, but similar to some asteroids. Large variations in albedo and color on Tempel 1 are observed for very small areas where the exposed water ice has been confirmed earlier. The albedo and color variations show correlations with each other, and with geological features. A relatively higher roughness of about $30^\circ$ is evident for a small area close to the east limb of the nucleus, possibly indicating a different geological or activity history for this area from the rest of the surface.