

The Phase Function of the Nucleus of Comet 9P/Tempel 1 and Results from Deep Impact

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In the context of the coordinated Earth-based observing program for the Deep Impact mission, considerable effort was spent in characterizing the properties of the nucleus prior to encounter. One aspect was a determination of the scattering properties of the surface materials by looking at the phase function at small phase angles to look for the opposition surge. From 13 Aug 2001 through 31 Dec 2001 the comet passed through phase angles between 1.8 and 14 degrees, with minimum on 12 Nov 2001. At the time the comet was outbound at heliocentric distance of 4.12-4.54 AU, and apparently inactive. A second opportunity to observe the opposition surge occurred with observations between 1 Oct 2003 and 24 Feb 2004 when the comet passed between 13.3 and 1.8 degrees phase angle, with the minimum on 2 Jan 2004. The comet was between 4.3-3.2 AU inbound and inactive. We will discuss the removal of the rotational light curve signature from the data, and the resulting phase curve and opposition surge. The magnitude and width of the opposition surge are related to the porosity of the surface materials and albedo, whereas the phase function at larger phase angles observed by the Deep Impact spacecraft on approach to the comet (20-63 degrees) gives information on larger scale roughness. We will compare the small phase angle results with the phase function from the spacecraft and summarize the results in the context of the Earth-based observing program (and will describe this briefly) which placed constraints on the dust material properties of the surface materials at impact.