

The pre-impact coma and nucleus colors of Comet 9P/Tempel 1:

1 Deep Impact imaging results.

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Color images from both HRI and MRI on the Deep Impact spacecraft produce images of the coma and nucleus before and after impact between 309 and 950 nm. The distribution of gas and dust is measured at pixel scales of 25 m and $S/N > 3$. Filters are designed to measure OH (309 nm), CN (387 nm), and C_2 (514 nm) as well as dust continuum at 345 and 526 nm, a clear filter at 650 nm, and broadband, context filters at 750 and 950 nm. The HRI has broadband filters between 350 and 950 nm with 100 nm band passes. These are designed for nucleus color measurements. A sequence of long exposure color images were acquired 5 hours before impact, when the spatial resolution was between 2200 and 1940 km/pixel. Another sequence was acquired 1 minute before impact. We look for relationships between gas and dust (coupling and decoupling) and their distributions with respect to the nucleus that reveal evidence of preferential outgassing. There is enhancement of gas and dust in the sunward direction, toward the south and at discrete, smaller areas at the north, which are not as prominent as the southward fan. The broadband visible spectrum of the nucleus shows no evidence of broad absorption features at the resolution of the filters (100 nm). Relative I/F increases with increasing wavelength by 12% over the observed spectral range (309-950 nm). The color of the nucleus is converted to B, V and R colors and compared to other short period comets. $B-V = 0.79 \pm 0.04$ and $V-R = 0.47 \pm 0.07$ which is within the observed range of short period comets, making Tempel 1 a reasonably average comet with respect to nucleus color.