

A month-long near-IR photometric observations of Comet 9P/Tempel 1 with IRSF/SIRIUS

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We carried out photometric observations of Comet 9P/Tempel 1, the target of NASA's Deep Impact (DI) mission, with the near-infrared camera SIRIUS (Simultaneous Three-Color Infrared Imager for Unbiased Survey) mounted on the IRSF (Infrared Survey Facility) 1.4 m telescope at the Sutherland South African Astronomical Observatory from June 27 to July 28, 2005. Our observations have two important characteristics. First, our observations were conducted for a month. Such a long-term observation is very valuable because most of observations covered only a few days after the impact. Second, broad-band imaging in near-IR enable us to observe only the dust component because there was no strong gas emission in this wavelength range. Images were taken in J ($\lambda=1.25$ micron), H ($\lambda=1.65$ micron), Ks ($\lambda=2.15$ micron) simultaneously.

The first result is the variation in brightness of the comet before and after the impact. After the impact, the comet brightened by 0.3-0.4 magnitude in each filter band. However, the brightness did not last; it gradually lowered and returned almost to the pre-impact brightness about three days later. This result suggests that no active region was formed on the comet nucleus by the impact. The second result is the data on color. The difference between J and H (i. e., J-H) was 0.45 and H-Ks was 0.15 over the observing period. There was no color change by the impact. The third result is the ejecta velocity. It was estimated to be 115-150 m/s when ejecta is assumed to move at an approximately constant velocity. The fourth result is the time variation of angular distribution of ejecta during a few days after the impact. The ejecta were pushed to the opposite side of the Sun by the effect of solar radiation pressure. Such data on the trajectory of ejecta particles will allow us to estimate the beta value (the ratio of solar radiation pressure to momentum), which is directly related to the mean size of the ejecta dust.