

The Stardust NExT Mission to Tempel 1. J. Veverka¹, K. Klaasen², T. Duxbury², A. Wolf², A. Chevront³, and the Stardust NExT Science Team, ¹Center for Radiophysics and Space Research, Cornell University, Ithaca, NY 14853, veverka@astro.cornell.edu, ²Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109, kenneath.p.klaasen@jpl.nasa.gov, tduxbury@jpl.nasa.gov, aron.a.wolf@jpl.nasa.gov, ³Lockheed Martin Space Systems, Denver, CO 80201, allan.r.chevront@lmco.com.

Introduction: The Stardust-New Exploration of Tempel (Stardust-NExT) mission was selected by NASA as a Discovery Mission of Opportunity in July, 2007. The NExT mission uses the Stardust spacecraft to effect a flyby of comet Tempel 1 at 200 km on February 14, 2011 (39 days post perihelion) and obtain high-resolution images of the coma and nucleus, as well as measurements of the composition, size distribution, and flux of dust emitted into the coma. Stardust-NExT will complete and expand the investigation of comet Tempel 1 initiated by Deep Impact (DI), and for the first time assess the changes in the surface of a comet between two successive perihelion passages. Stardust-NExT will also provide important new information on how Jupiter family comets evolve and how they were put together at their formation 4.6 billion years ago.

Mission goals:

1. Document the style and amount of sublimational erosion and other surface changes occurring between successive perihelion passages of a comet.
2. Extend the geologic mapping of the nucleus of Tempel 1 to elucidate the extent and nature of layering and help constrain models of the formation and structure of comet nuclei [1].
3. Extend the study of smooth flow deposits, active areas, and known exposures of water ice.
4. If possible, determine the size and depth of the crater formed by DI and map any evidence of crater ejecta to provide constraints on models of crater formation and to derive further information on the structural properties of the nucleus of Tempel 1. (The DI impact produced so much fine ejecta that DI did not succeed in imaging the crater.)

Mission status: At the Earth flyby in January, 2006 (during which a capsule with a coma sample from comet Wild 2 was returned to Earth), the Stardust spacecraft was placed into a 1.5-year heliocentric orbit, returning to Earth in January 2009. The 2009 Earth flyby provides a gravitational assist to target to Tempel 1. The spacecraft

remains in excellent condition and is ready for its encounter with Tempel 1.

References:

- [1] P.C. Thomas, et al. (2007) *Icarus*, 187, 4-15.

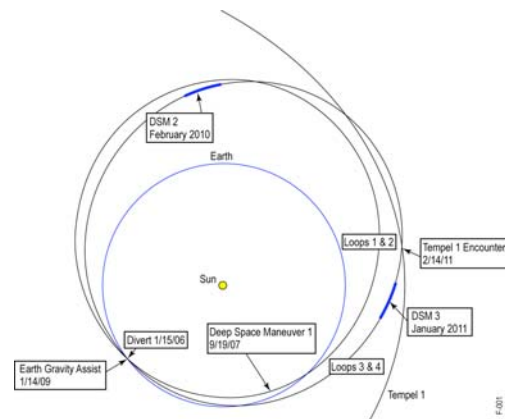


Figure 1. After an Earth swingby in Jan. 2009 Stardust NExT will encounter Tempel 1 in Feb. 2011 at 10.9 km/sec.

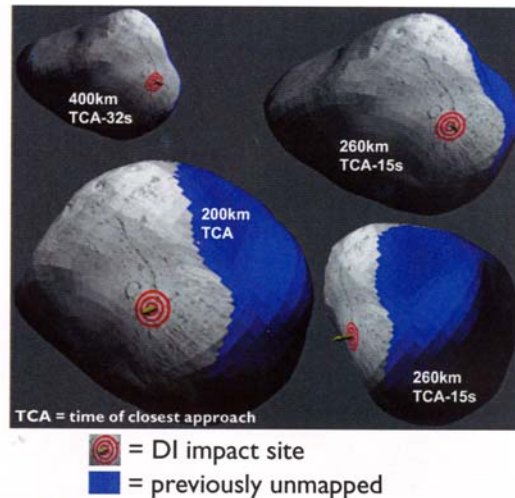


Figure 2. During the flyby at 200 km the spacecraft will image portions of the nucleus previously seen by Deep Impact, including the impact site, and extend coverage into previously unseen territory. Best image resolution will be 12 m/pxl.