



Cometary cryo-volcanism: Stardust-NExT imaging of outburst locations.

M.J.S. Belton (1), P. Thomas (2), H.J. Melosh (3), M.F. A'Hearn (4), J. Veverka (2) and the Stardust-NExT science team.
(1) Belton Space Exploration Initiatives, LLC, 430 S Randolph Way, Tucson 85716, Arizona, USA, (2) Cornell University, Ithaca, NY, USA, (3) Purdue University, West Lafayette, IN, USA, (4) University of Maryland, College Park MD, USA.
(mbelton@dakotacom.net)

Abstract

New data obtained during the Stardust-NExT mission encounter has led to a substantial increase in the accuracy of the spin pole determination and shape model of the nucleus of comet 9P/Tempel 1. This has allowed improved determination of the locations of the mini-outbursts [1] that were discovered, but not imaged, around the Deep Impact mission encounter. The expanded mapping of the surface accomplished by Stardust-NExT includes high-resolution (~20 m/pixel) coverage of one of these areas under good lighting conditions thus providing views of candidate features caused by outburst eruptions and, possibly, a surface feature associated with the pre-eruption state. Plausible candidates for post-eruption features, located within 10° of the nominal location, are several irregularly shaped, fresh looking, depressions with central peaks. Also seen in the same region are two relatively smooth positive elevation features that we postulate may be associated with the pre-eruptive state. We compare these features to the full range of depression morphologies seen elsewhere on the imaged surface and discuss the possibility that most of the depressions seen on the surface were caused by outburst activity and subsequently eroded by sublimation. The mechanism responsible for outburst activity proposed earlier by Belton and Melosh [2] is briefly discussed in light of these new findings.

Acknowledgements

Stardust-NExT was supported by NASA as part of its Discovery Program. We acknowledge and express our thanks to our colleagues at Lockheed Martin Aerospace in Denver, at the Jet Propulsion Laboratory, and in the Deep Space Network for their dedication to this project.

References

- [1] Belton, M.J.S., Feldman, P., A'Hearn, M.F. and Carcich, B.; Cometary cryo-volcanism: Source regions and a model for the UT 2005 June 14 and other mini-outbursts on Comet 9P/Tempel 1, *Icarus*, 198, 189–207, 2008.
- [2] Belton, M.J.S. and Melosh, H.J.; Fluidization and multiphase transport of particulate cometary material as an explanation of the smooth terrains and repetitive outbursts on 9P/Tempel 1, *Icarus* 200, 280-291, 2009.