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A comparative analysis of water ice on the surface of comets Tempel 1 and 67P/Churyumov-Gerasimenko

A. Raponi, F. Capaccioni, M.C. De Sanctis, M. Ciarniello, G. Filacchione, F. Tosi, E. Palomba, M.T Capria, G. Piccioni, P. Cerroni, A. Longobardo, A. Migliorini, and Rosetta VIRTIS team

INAF-IAPS, Istituto di Astrofisica e Planetologia Spaziali, Area di Ricerca di Tor Vergata, via Fosso del Cavaliere 100, 00133 Roma, Italy

Abstract.

In this work we compare data of two spectrometers onboard space missions directed to comets: HRI (High Resolution Imager) on board Deep Impact (A'Hearn et al. 2005) which overflown Tempel 1 on 2005 July 4th, and VIRTIS (Visible InfraRd and Thermal Imaging Spectrometer) onboard Rosetta which nowadays is orbiting around Comet Churyumov-Gerasimenko (Coradini et al. 2007). This work is focused on the detection of water ice on the surface, which seems to be present on both comets in two distinct modalities:

•small grain size (1-2 μm), as derived in the material ejected from the surface of Tempel 1 after the impact (Sunshine et al. 2007), and on the surface of 67P/C-G as result of vapour recondensation (De Sanctis et al. 2015).

•large grain size (>30 μm), in minor amounts, detected as exposed ice on both comets (Sunshine et al. 2006; Raponi et al. 2013; Filacchione et al. 2015).

These two modalities are related to different spectral features. To retrieve the physical properties of the surface we apply the Hapke scattering model to the measured spectra. The data are corrected for artifacts and thermal emission before comparing them with the model. Moreover the estimated signal to noise ratio is taken into account by a least square optimization algorithm in the fitting procedure.

This comparative analysis could reveal common processes for comets, which have implication on their formation and evolution. Authors acknowledge the funding from Italian, French and German Space Agencies.

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