

# VIRTIS/Rosetta observes Comet 67P/Churyumov-Gerasimenko: Nucleus derived composition and physical properties.

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The paper will describe the major results obtained so far by the Visible, Infrared and Thermal Imaging Spectrometer (VIRTIS), the dual channel spectrometer onboard Rosetta, on the surface composition and physical properties of the nucleus of comet 67P/Churyumov-Gerasimenko and the implications on the origin and evolution of the nucleus.

These results were achieved studying the reflected and emitted radiance of the comet in the spectral range 0.25-5.0  $\mu\text{m}$  with a Mapping Spectrometer (VIRTIS-M) and a High Resolution Spectrometer (VIRTIS-H) (1). The nucleus observations were performed with spatial resolution varying from the initial 500m down to 2.5m and have generated compositional maps of the illuminated areas. The nucleus integrated normal albedo has been calculated as  $0.060 \pm 0.003$  at 0.55  $\mu\text{m}$  (2), and reflectance spectra display distinct gradients in the VIS and IR regions (5-25 and 1.5-5 %  $\text{k}\text{\AA}^{-1}$  respectively). These results suggest a surface made of an association of carbon bearing species and opaque minerals such as sulfides. In addition a broad absorption feature in the 2.9-3.6 $\mu\text{m}$  range has been observed; this band is present across the entire illuminated surface and, its shape and width are compatible with absorptions due to non-volatile organic macromolecular materials, complex mixture of various types of C-H and/or O-H chemical groups (3,4). Ice rich regions of limited extent have also been observed either as an ephemeral source, resulting from the diurnal re-deposition at the surface of water ice sublimating in the interior (5), or as temporally stable regions, resulting from exposure of deeper layers after landslides or debris falls. Spectral modeling of these regions has pointed out the presence of a wide range of sizes of water grains, ranging from few  $\mu\text{m}$  to several mm. The implication of this finding in terms of the evolutionary processes that may have affected and shaped the surface of 67P/CG will be discussed.

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## References

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**Auteur principal:** CAPACCIONI, Fabrizio (IAPS-INAF)

**Co-auteurs:** RAPONI, Andrea (IAPS-INAF); SCHMITT, Bernard (Université Grenoble Alpes, CNRS, IPAG); LEYRAT, Cedric (LESIA Obspm); BOCKELEEE-MORVAN, Dominique (LESIA-OBSPM); QUIRICO, Eric (Université Grenoble Alpes, CNRS, IPAG); TOSI, Federico (IAPS-INAF); ARNOLD, Gabriele (DLR); FILACCHIONE, Gianrico (IAPS-INAF); MOROZ, Ljuba (DLR); DE SANCTIS, Maria Cristina (IAPS-INAF); CAPRIA, Maria Teresa (IAPS-INAF); CIARNIELLO, Mauro (IAPS-INAF); DROSSART, Pierre (LESIA Obspm); CARLSON, Robert (LPL, University of Arizona, USA); ERARD, Stephane (LESIA - OBSPM); MENNELLA, Vito (Osservatorio di Capodimonte, Italy)

**Orateur:** CAPACCIONI, Fabrizio (IAPS-INAF)

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