Geophysical Research Abstracts
Vol. 17, EGU2015-9241-1, 2015
EGU General Assembly 2015


# Spectrophotometry, colors, and photometric properties of the 67P/Churyumov-Gerasimenko nucleus from the OSIRIS instrument onboard the ROSETTA mission

Sonia Fornasier (1), Pedro Hasselmann (1), Clement Feller (1), Maria Antonietta Barucci (1), Luisa Lara (2), Nilda Oklay (3), Cecilia Tubiana (3), Sebastien Besse (4), Frank Scholten (5), Holger Sierks (3), Cedric Leyrat (1), Fiorangela La Forgia (6), Monica Lazzarin (6), Maurizio Pajola (6), Nick Thomas (7), Antoine Pommerol (7), Matteo Massironi (8), and the OSIRIS Team

(1) Observatoire de Paris/Univ. of Paris 7, LESIA, Meudon, France (sonia.fornasier@obspm.fr), (2) Instituto de Astrofisica de Andalucia - CSIC, Granada, Spain, (3) Max Planck Institut fur Sonnensystemforschung, Gottingen, Germany, (4) ESA-ESTEC ,Noordwijk, The Netherlands, (5) DLR-Institute of Planetary Research, Berlin, Germany, (6) Department of Physics and Astronomy "G. Galilei"/CISAS, University of Padova,Padova, Italy, (7) Physikalisches Institut, Bern University, Bern, Switzerland, (8) Dipartimento di Geoscienze, Universita' degli Studi di Padova, Padova, Italy

Rosetta is the cornerstone mission of the European Space Agency devoted to the study of Solar System minor bodies. Launched on 2 March 2004, Rosetta arrived on August 6, 2014, at the comet 67P/Churyumov-Gerasimenko after 10 years of interplanetary journey. Rosetta is now in the main science escort phase of the comet after the successful delivery of the lander Philae on its surface on November 12, 2014.
In this work we present the results on the 67P nucleus physical properties derived from the OSIRIS imaging system observations obtained in July- mid August 2014, during the comet approach phase and the first bound orbits. In this timeframe, OSIRIS has mapped the comet surface with a resolution up to 2 m/px with several filters covering the 250-1000 nm range, and at different phase angles (1.3-54 degrees).
The images have been reduced using the OSIRIS standard pipeline, and then transformed into I/F reflectance. A 3D shape model of the nucleus, determined from the images obtained during the mapping phase, has been used to retrieve the illumination and geometric conditions of each image. Color cubes of the surface have been hence produced by stacking registered and photometrically corrected images.
Globally, the nucleus has spectrophotometric properties in the NUV-VIS-NIR range similar to those of bare cometary nuclei, of primitive D-type asteroids such us Jupiter Trojans, and of the moderately red Transneptunians and Centaurs. No clear absorption bands have been detected so far at the resolution of the used filters. The global spectral slope, evaluated in the 535-880 nm range, varies between 11 %/(100 nm) at a phase angle of 1.3 degrees and 16 %/(100 nm) at a phase angle of 52 degrees, implying a significant phase reddening.
Despite the different types of terrains and morphological features seen on the comet (Thomas et al. 2015), the nucleus shows small color variations, with the notable exception of the Hapi region (Sierks et al., 2015). This region is located between the two lobes of the comet, and is both the most active and brightest surface on the comet. This region has a bluer spectral slope than the darker regions that we interpret being caused by a higher abundance of water ice in the surface composition, although we note that no water ice absorption bands have been detected with the VIRTIS infrared imaging spectrometer during the August-September observations at resolutions of 15-25 m/px (Capaccioni et al. 2015). The absence of large areas of water ice rich mixtures in VIRTIS data may be attributed to their lower spatial resolution than the OSIRIS images, together with the presence of non-volatile materials that may mask the water ice spectral absorptions.

We will present the results of the global photometric properties in several filters, derived using the Hapke model, together with the analysis of the local colors spectrophotometry, and albedo variations of the 67P nucleus. This unique data set places further constraints on the origin and distribution of cometary activity on the surface.

References:

Capaccioni et al, 2015, Science, in press
Sierks et al, 2015, Science, in press
Thomas et al., 2015, Science, in press