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BRIGHT ICE SPOTS ON THE NUCLEUS OF COMET 67P/CHURYUMOV-GERASIMENKO AS OBSERVED BY ROSETTA OSIRIS AND VIRTIS INSTRUMENTS

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OSIRIS and VIRTIS TEAMS

Since the Rosetta mission arrived at the comet 67P/Churyumov-Gerasimenko (67/P C-G) on August 2014, the comet nucleus has been mapped by both OSIRIS (Optical, Spectroscopic, and Infrared Remote Imaging System), and VIRTIS (Visible Infrared Thermal Imaging Spectrometer) acquiring a huge quantity of surface's images and spectra, producing the most detailed maps at the highest spatial resolution of a cometary nucleus. The OSIRIS imaging system (NAC WAC) has a set of filters at different wavelengths from the ultraviolet (269 nm) to the near-infrared (989 nm). The OSIRIS imaging system has been the first instrument with the capability to map a comet surface at a high resolution reaching a maximum resolution of 11cm/px during the closest fly-by on February 14, 2015 at a distance of about 6 km from the nucleus surface while the VIRTIS spectro-imager (with two channels M and H) operates from 0.25 to 5m with medium and high spectral resolution. The spectral analysis on global scale from the VIRTIS data indicates that the nucleus presents different terrains covered by a very dark and dehydrated organic-rich material [1]. OSIRIS images indicate a morphologically complex and dark surface with a variety of terrain types and several intricate features [2]. The surface shows albedo variation and from the spectrophotometric analysis a large heterogeneity on the surface properties [3, 4, 5]. Limited evidences of exposed H₂O ice have been found on the surface of 67/P C-G up to now [6, 7, 8], even though ices are considered to be a major constituent of cometary nuclei.

The aim of this work is, taking advantage of the high resolution of the OSIRIS images, i) to detect the bright spots at all dimensions by albedo and spectral slope analyses, ii) to select those spots which could be resolved by VIRTIS and iii) to deeply analyse the corresponding spectra.

The OSIRIS analysis has been carried out on the colours and spectrophotometry of the whole 67/P C-G nucleus from images acquired since the first Rosetta bound orbits in August 2014 up to the end of 2015. The bright spots are spread everywhere on the surface. The analysis of the VIRTIS spectra on the selected positions by OSIRIS allowed us to detect eight spots with positive H₂O ice signatures detection.

The obtained results with the computed models will be presented and discussed.

References: [1] Capaccioni et al. 2015. Science 347, DOI: 10.1126/science.aaa0628 [2] Sierks et al.2015. Science 347, DOI: 10.1126/science.aaa1044 [3] Fornasier et al. 2015. AA, 583, A30 [4] Ciarniello et al., 2015, AA, 583, A31 [5] Oklay et al. 2016. AA 586, A80 [6] Pommerol et al. 2015. AA, 583, A25 [7] De Sanctis et al. 2015. Nature 525, 500 [8] Filacchione et al. 2016. Nature 529, 368.