Compositional maps of 67P/CG nucleus surface after perihelion passage by Rosetta/VIRTIS

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ABSTRACT

Moving after perihelion passage (August 13th 2015), VIRTIS-M[1] the 0.25-5.0 µm imaging spectrometer on board Rosetta has mapped again the north and equatorial regions of 67P/CG's nucleus with the scope to trace color and composition evolution of the surface. With the loss of the IR channel due to the active cryogenic cooler failure occurred in May 2015, VIRTIS-M has observed only with the VIS channel in the 0.25-1.0 µm spectral range. Despite this limitation, the returned data are valuable in performing a comparison of surface properties between pre and post-perihelion times. Approaching perihelion passage, 67P/CG's nucleus has experienced a general brightening due to the removal of the surficial dust layer caused by the more intense gaseous activity with the consequent exposure of a larger fraction of water ice[2]. Coma observations by VIRTIS during pre-perihelion have shown a correlation between the areas of the nucleus where gaseous activity by water ice sublimation is more intense[3] with the surface brightening caused by dust removal. After having applied data calibration[4] and photometric correction[5], VIRTIS data are projected on the irregularly shaped digital model[6] of 67P/CG with the aim to derive visible albedo and colors maps rendered with a spatial resolution of 0.5×0.5 deg in latitude-longitude, corresponding to a sampling of about 15 m/pixel. Dedicated mapping sequences executed at different heliocentric distances, are employed to follow the dynamical evolution of the surface. Direct comparison between compositional maps obtained at the same heliocentric distances along inbound and outbound orbits allows to evidence the changes occurred on the same areas of the surface. In this context, the first VIRTIS-M maps, obtained in August 2014 at heliocentric distance of 3.4 AU along the inbound orbit with a solar phase angle of about 30-45° are compared with the last ones, taken in June 2016 at 3.2 AU from the Sun on the outbound trajectory at solar phases of about 40-50°. In particular we focus our investigation on the two large Bright Albedo Patches (BAPs) where water ice exposures have been detected before perihelion[7]. The availability of these datasets acquired with unprecedented spatial and spectral resolutions gives us the opportunity to study temporal changes occurring on a comet's nucleus during the perihelion passage.

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