The seasonal cycle of water ice at the surface of 67P/Churyumov-Gerasimenko as observed by VIRTIS on board Rosetta

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Rosetta was the first mission escorting a comet, 67P/Churyumov-Gerasimenko (67P hereafter), for two years along its orbit (August 2014 - September 2016). This allowed us to follow the evolution of the nucleus surface and activity as 67P was approaching the Sun from a heliocentric distance of 3.62 AU to 1.25 AU (perihelion), and along the outbound part of the orbit up to 3.8 AU.
Systematic analysis carried out by means of the VIRTIS-M VIS channel (0.24-1.04 μm) across different areas on the nucleus shows that the observed spectral slope gets bluer with the comet approaching perihelion, while the original colors are progressively restored along the outbound leg of the orbit with the comet receding from the Sun. We interpret this color variation with a variation of the water ice abundance on the surface. The described behavior suggests the presence of a seasonal cycle, with an increase of water ice on the nucleus with 67P approaching the Sun, followed by a progressive reduction after perihelion. Although this global trend is common to the whole surface, some variability in the temporal profile of the spectral slope for different areas is observed. We investigate whether these effects are related to the different insolation conditions and/or physical properties at different locations on the nucleus. These results will be also compared to the temporal variability of dust production with the aim to characterize the thermo-physical processes influencing the surface water ice content.
Along with this, we study the diurnal cycle of water ice (De Sanctis et al., 2015) on the surface of 67P across the whole mission. We focus on the Imhotep region, investigating how this cycle is modulated by seasonal effects.