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Abstract

The paper will describe the major results obtained throughout the nominal mission by the instrument VIRTIS (Visible, Infrared and Thermal Imaging Spectrometer), the dual channel spectrometer onboard Rosetta, on the surface composition and thermal properties of the nucleus of comet 67P/Churyumov-Gerasimenko and on the 2D distribution of H₂O and CO₂ in the coma. VIRTIS is a dual channel spectrometer; VIRTIS-M (M for Mapper) is a hyper spectral imager covering a wide spectral range from 0.25 through 5 μ m. VIRTIS-M uses a slit and a scan mirror to generate images with spatial resolution of 250 μ rad over a FOV of 3.7°. The second channel is VIRTIS-H (H for High-resolution), a point spectrometer with high spectral resolution ($\lambda/\Delta\lambda=3000$ @3 μ m) in the range 2-5 μ m. The nucleus observations have been performed in a wide range of conditions with best spatial resolution of 2.5m. The surface temperature has been determined since the first distant observations when the nucleus filled one single VIRTIS-M pixel and continuously monitored since. Maximum temperature determined until April 2015 are as high as 300K at the subsolar point. Modeling of the thermophysical properties allowed to derive the thermal inertia of the crust. The VIRTIS composition analysis has showed evidence of carbon-bearing compounds on the nucleus of the comet 67P/Churyumov-Gerasimenko. The very low reflectance of the nucleus (normal albedo of 0.060 ± 0.003 at 0.55 μ m), the spectral slopes in VIS and IR ranges (5-25 and 1.5-5 % $\text{k}\text{\AA}^{-1}$) and the broad absorption feature in the 2.9-3.6 μ m range present across the entire illuminated surface, are compatible with a surface crust made of a complex mixture of dark disordered poly-aromatic compounds, opaque minerals and several chemical species containing: -COOH, CH₂ / CH₃, -OH (in Alcohols) and possibly NH₄⁺. Both channels are contributing to the determination of the spatial distribution of H₂O and CO₂ in the coma; their abundances as a

function of altitude and of time of day. Authors acknowledge the support from national funding agencies.