Cometary coma dust size distribution from in-situ IR spectra

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The study of cometary dust, the most abundant material in the coma of comet, is a crucial key to understand the original materials forming the solar system. The measure of the differential size distribution provides a tool to investigate the nature of cometary dust. Rosetta followed comet 67P/Churyumov-Gerasimenko (67P/CG) from 2014 August to 2016 September. It was a unique opportunity for the Grain Impact Analyser and Dust Accumulator (GIADA) and the Visual, Infrared and Thermal Imaging Spectrometer (VIRTIS-M), spectral range 0.25-5 μm, to acquire a relevant amount of dust coma measurements. The comparison between VIRTIS-M and GIADA data provides a powerful means to characterize the dust coma properties. Rosetta flew around 67P/CG at speeds lower than the dust particle radial velocities and, the GIADA data we used to derive the dust size distribution were obtained excluding any contribution from the dust reflected by the solar radiation pressure, and reduces the uncertainties introduced by the unknown ejection anisotropy. In April 2015, VIRTIS-M observed the radiance in the spectral wavelength range 1-5 μm, which is sensitive to the dust size distribution. We obtain the best fit of the IR data with a differential dust size distribution, which is a power-law with index of -3.1(-0.1)$^{+3}$. This index matches that measured by GIADA on September 2014, and March 2015, indicating that, before perihelion, the inner coma radiance is dominated by a particle size greater than 10 μm and the dust coma did not change its properties during most of the inbound orbit.