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Surface Activity Distributions of Comet 67P/Churyumov-Gerasimenko Derived from VIRTIS Images

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Abstract

The outgassing mechanism of comets still remains a critical question to better understand these objects. The Rosetta mission gave some insight regarding the potential activity distribution from the surface of the nucleus of comet 67P/Churyumov-Gerasimenko, Fougere et al. (2016) used a spherical harmonics inversion scheme with in-situ measurements from the ROSINA instrument to derive mapping of the broad distribution of potential activity at the surface of the nucleus. Marschall et al. (2017) based on the appearance of dust active areas suggested that the so-called "neck" region and regions with fractured cliffs and locally steep slopes show more activity than the rest of comet 67P's nucleus. Using in situ ROSINA measurements from a distance makes it difficult to distinguish between these two scenarios because the fast expansion of the gas and large molecular mean free paths prevents distinguishing small outgassing features even when the spacecraft was in bound orbits within 10 km from the nucleus. In this paper, we present a similar numerical inversion approach using VIRTIS images, which should better probe the very inner coma of comet 67P and give more detailed information about the outgassing activity. Support from contracts JPL #1266314 and #1266313 from the US Rosetta Project and grant NNX14AG84G from the NASA Planetary Atmospheres Program are gratefully acknowledged.