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The Coma of Comet 67P/Churyumov-Gerasimenko Pre- and Post-Equinox

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As the Rosetta spacecraft escorts comet 67P/Churyumov-Gerasimenko (67P) during its journey in the Solar System, it monitors the evolution of the neutrals' distribution in the coma of 67P. Indeed, while the comet orbits around the Sun, the energy input received by the different regions of the nucleus varies, directly impacting 67P's outgassing pattern.

We model the H_2O, CO_2, and CO coma of Comet 67P/Churyumov-Gerasimenko (67P) pre- and post-equinox using a 3D Direct Monte-Carlo Simulation approach. The use of a kinetic method enables us to model the coma from the nucleus' surface to a few hundreds of kilometers even in the regions where collisions cannot maintain a fluid regime. The activity at the surface of the nucleus is described using a spherical harmonic expansion with 25 terms constrained by ROSINA (Rosetta Orbiter Spectrometer for Ion and Neutral Analysis) observations. The model outputs contain information about numerous macroscopic parameters such as number densities, velocities, and temperatures of each species. Then, the results from the simulations are integrated along the line of sight to be compared with the remote sensing observations from the VIRTIS (Visible and Infrared Thermal Imaging Spectrometer) instrument. The model shows a good agreement with the data, giving a clear evidence of our understanding of the physics of the coma of comet 67P.