The Heterogeneous Coma of Comet 67P/Churyumov-Gerasimenko from Rosetta Observations

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Since its orbit insertion around comet 67P/Churyumov-Gerasimenko (CG), the Rosetta spacecraft has revealed invaluable information regarding the cometary coma environment. The prolonged period of observation enabled a relatively extensive spatial coverage of comet CG's coma, which showed distinct spatial distributions for different species.

We introduce a fully 3D kinetic model performed with the Direct Simulation Monte-Carlo approach of the H_2O, CO, and CO_2 coma of comet CG using the Adaptive Mesh Particle Simulator code with the shape model of the Rosetta nucleus. The model allows the description of the full coma of comet CG including the regions where collisions cannot maintain a flow that can be described by a fluid. The model is constrained by Rosetta observations giving clues regarding the gas release of the different species. This constitutes the most advanced coma model of comet CG, which is critical to interpret instrument data and for further mission planning.