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Modeling of the illumination driven coma of 67P/Churyumov-Gerasimenko

André Bieler and the ROSINA Team
University of Michigan, Ann Arbor, United States (abieler@umich.edu)

In this paper we present results modeling 67P/Churyumov-Gerasimenko's (C-G) neutral coma properties observed by the Rosetta ROSINA experiment with 3 different model approaches. The basic assumption for all models is the idea that the out-gassing properties of C-G are mainly illumination driven. With this assumption all models are capable of reproducing most features in the neutral coma signature as detected by the ROSINA-COPS instrument over several months. The models include the realistic shape model of the nucleus to calculate the illumination conditions over time which are used to define the boundary conditions for the hydrodynamic
(BATS-R-US code) and the Direct Simulation Monte Carlo (AMPS code) simulations. The third model finally computes the projection of the total illumination on the comet surface towards the spacecraft.
Our results indicate that at large heliocentric distances (3.5 to 2.8 AU) most gas coma structures observed by the in-situ instruments can be explained by uniformly distributed activity regions spread over the whole nucleus surface.