

Evolution of the electron number density in the coma of 67P at the location of Rosetta from November 2015 through March 2016

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Abstract

We present a comparison between modeled and observed electron number densities in the coma of 67P at the location of Rosetta from November 2015 through March 2016. During this time interval the heliocentric distance of 67P increased from ~ 1.5 AU to ~ 2.5 AU while the cometocentric distance of Rosetta decreased from ~ 300 km to ~ 10 km prior to the nightside excursion in the end of March 2016. The model, applied in previous case studies, is based on a scaling to the neutral number density (as measured by ROSINA/COPS) taking into consideration the cometocentric and heliocentric distance. The key underlying assumptions in the model is that the plasma is produced pre-dominantly by photoionization, moves radially outwards with the same bulk speed as the neutrals and is not subject to severe reduction via dissociative recombination. The modeled electron number densities are markedly (typically by a factor of 5 or so) higher than those observed by RPC-MIP when close to perihelion and hundreds of km from the nucleus. At higher heliocentric distances (at lower activity) but closer to the nucleus the model instead, in an average sense, reproduces the observations well. Potential reasons for this trend will be discussed. It is noted that we see no clear correlation between the theorized ion-neutral decoupling distance and how well the model reproduces the observations.