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Multi-instrument analysis of FUV emissions at comet 67P

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Abstract

The Rosetta mission escorted comet 67P/Churyumov-Geramisenko for 2 years from August 2014 to September 2016, allowing observations of the cometary plasma environment throughout this period. We use a multi-instrument analysis to examine emissions from the coma of 67P in the far ultraviolet (FUV) at large heliocentric distances. Emissions from dissociative excitation of cometary neutrals by electron impact are modelled from in-situ measurements and compared to the remote-sensing observations of the Alice FUV imaging spectrograph on board Rosetta. The Ion and Electron Sensor (IES) and the LAngmuir Probe (LAP), of the Rosetta Plasma Consortium (RPC), probe the electron environment at the position of the spacecraft. The composition of the cometary neutrals is measured by the Double Focusing Mass Spectrometer (DFMS), part of the Rosetta Orbiter Spectrometer for Ion and Neutral Analysis (ROSINA). Dissociative excitation cross sections for the major neutral species, H_2O, CO_2, CO and O_2, are combined with the electron particle flux to calculate the column integrated brightness of the following atomic lines: Lyβ, OI1304, OI1356, CI1657 and CII1335. We account for the overlapping bands of the CO Fourth Positive Group. We first consider a nadir viewing geometry over a shadowed nucleus to minimise contamination from the reflected solar flux and the extended coma. We provide a comparison of observed and forward modelled brightnesses for the hydrogen, oxygen and carbon lines away from perihelion. We also investigate the impact of corotating interaction regions (CIRs) on the energetic electron population at 67P and the link to FUV emissions during the summer of 2016.