2 years with comet 67P/Churyumov-Gerasimenko: H_2O, CO_2, CO as seen by ROSINA RTOF

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Abstract

The Rosetta space mission investigated comet 67P/Churyumov-Gerasimenko (67P) over two years from August 2014 to September 2016. Onboard the spacecraft, the ROSINA experiment included two mass spectrometers to derive the composition of neutrals and ions, and a COmet Pressure Sensor (COPS) to monitor the density and velocity of the neutrals in the coma. We will here analyse and discuss data from the Reflectron-type Time-Of-Flight instrument during the comet escort phase. The RTOF mass spectrometer possessed a wide mass range and a high temporal resolution (Balsiger et al., 2007). The analysis of 67P/C-G's coma major molecules over the mission showed strong variability of the comet coma's main volatiles concentrations (H2O, CO2, CO) and their relative abundances. The 2 years long Rosetta mission allowed us to observe the seasonal evolution in the atmosphere of 67P, in particular the change occurring during the equinoxes and at perihelion. In this work, we analyze the asymmetry in the outgassing rate before and after the perihelion (13/08/2015), the evolution of abundance ratios through the whole mission, and in particular the behavior of the very volatile CO molecules. Density maps projected on the surface of 67P demonstrate the evolution of the three main coma species after the outbound equinox. We will present first results of our comet nucleus thermal modelling used to simulate the internal structure and temperature evolution of 67P at characteristic surface areas. These results will be compared with the coma composition measurements obtained by ROSINA.