

Elemental and Molecular Composition of the volatiles in Comet 67P/Churyumov-Gerasimenko

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Rosetta accompanied comet 67P/Churyumov-Gerasimenko (67P/C-G) for more than 2 years and carried out an unprecedented in-depth investigation of the comet's nucleus and its surrounding gas, dust, and plasma environment. Comets contain some of the most pristine material in our solar system and these volatiles and refractory species remained well

preserved in the cold outer regions far from the Sun. Studying the composition of comets thus allows us to investigate the material present at the time and location of its formation and to some extent also its evolution.

On board Rosetta was the Rosetta Orbiter Spectrometer for Ion and Neutral Analysis (ROSINA) with the goal of measuring the gaseous species present in the coma of the comet. ROSINA measured volatiles in situ, i.e., at the location of the Rosetta spacecraft. ROSINA detected a wealth of different volatiles, from the major species H_2O , CO , CO_2 , and O_2 , to the (much) lesser abundant species including complex organics and noble gases. We found that the relative abundances of these atoms and molecules varied as a function of the comet's location and orientation with respect to the Sun as well as Rosetta's position with respect to the nucleus. Therefore, deriving bulk abundances of the different volatiles inside the nucleus from measurements obtained in the coma at a distance of several kilometers difficult.

In this presentation we report on our efforts obtaining bulk molecular and elemental ratios for the volatile species inside the nucleus of 67P/C-G and discuss some of the implications for the comet's origin and evolutionary history.