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Ion composition variety and variability around perihelion

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For two years, the Double Focusing Mass Spectrometer (DFMS), one of the Rosetta Orbiter Spectrometer for Ion and Neutral Analysis (ROSINA) onboard Rosetta probed the neutral gas and the plasma composition of the comet 67P/Churyumov-Gerasimenko's coma (67P). Major ion species detected include water ions (e.g, H_2O^+, H_3O^+, HO^+) observed throughout the escorting phase. The analysis of DFMS data revealed a large zoo of ion species near perihelion (summer 2015). In particular, protonated versions of high proton affinity neutrals (e.g., NH_4^+) were detected, but also hydrocarbon and organic ion species. Near perihelion, ion composition was also highly variable and showed interesting variations in the complexity of the observed ion species.

We will first present an overview of the rich variety of ion species observed during perihelion. This study will be supported by ionospheric modeling of ion composition below the ion exobase. We will then show an intercomparison between DFMS data and Rosetta Plasma Consortium (RPC) plasma and particle data to interpret the DFMS ion composition variability. Our primary goal is to highlight any correlation between observations from these different instruments (i.e. ion composition, ion and electron number density, energy distribution, magnetic field) and to find relevant signatures of physical processes which can affect the chemistry and dynamics (e.g., acceleration and deflection) of the involved neutral and ion species.