

Life cycle of a comet magnetosphere

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Rosetta has followed comet 67P from low activity at more than 3 AU heliocentric distance to high activity at perihelion and then out again. We study the evolution of the dynamic ion environment using the RPC-ICA ion spectrometer. Initially the solar wind permeated the near comet environment. The solar wind was deflected due to mass loading, but not much slowed down. In mid to late April 2015 the solar wind started to disappear from the observation region. This was associated with the solar wind deflection reaching 90° , indicating that the solar wind free region formed due to severe mass loading and associated solar wind deflection. A comet magnetosphere had formed. Accelerated water ions, moving mainly in the anti-sunward direction kept being observed also after the solar wind disappeared from the location of Rosetta. We report how the accelerated water ion environment changed as Rosetta was located relatively deeper in the comet magnetosphere as comet activity increased. Shortly after perihelion, Rosetta made an excursion to 1500 km cometocentric distance, the only data providing a spatial context to the observations made inside the comet magnetosphere once it formed.. We discuss the data from the excursion and what we learn about the scale size of the comet magnetosphere as well as the energy transfer from the solar wind to the comet environment inside the comet magnetosphere. As comet 67P is now moving away from the sun, beginning in late December 2015 the solar wind has started to permeate the comet environment again. We compare this with the early data when comet 67P was approaching the sun, and discuss whether we see any asymmetries between a growing and waning comet magnetosphere.