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# The superthermal ion environment near comet 67P/Churyumov-Gerasimenko at low activity

Hans Nilsson (1), Gabriella Stenberg Wieser (1), Etienne Behar (1), Masatoshi Yamauchi (1), Cyril Simon Wedlund (2), Esa Kallio (2), Jim Burch (3), Chris Carr (4), Anders Eriksson (5), Karl-Heinz Glassmeier (6), Jean-Pierre Lebreton (7), Pierre Henri (7), and Herbert Gunell (8)

(1) Institutet för Rymdfysik, Kiruna, Sweden (hans.nilsson@irf.se), (2) Aalto University, Aalto, Finland, (3) Southwest Research Institute, San Antonio, Texas, USA, (4) Imperial College, London, UK, (5) Institutet för Rymdfysik, Uppsala, Sweden, (6) TU-Braunschweig, Braunschweig, Germany, (7) CNRS, Orléans, France, (8) Belgian Institute for Space Aeronomy, Brussels, Belgium

The Rosetta mission has been designed to rendezvous with and escort comet 67P/Churyumov-Gerasimenko from a heliocentric distance of >3.6 AU, when the comet still has a low activity level, until perihelion passage at 1.25 AU where the comet reaches the maximum of its activity. Initially, the solar wind permeates the thin comet atmosphere that has just begun to form from sublimation. Eventually the size and plasma pressure of the ionized atmosphere leads to the formation of plasma boundaries: a magnetosphere is born. Using the Rosetta Plasma Consortium Ion Composition Analyzer, we study the gradual evolution from the first detectable traces of water ions to the stage where the comet atmosphere starts to repel the solar wind at a distance from the sun of about 3.3 AU. Gradually the mass loading caused by picked-up comet ions starts to deflect the solar wind. Charge exchange between the solar wind and comet atmosphere gradually increases with comet activity, leading to a situation where a significant fraction of the solar wind has charge-exchanged close to the comet nucleus. Pick up ions created upstream of the comet nucleus are accelerated by the solar wind electric field and are seen with energies up to about 1 keV as they move back towards the nucleus. Locally produced water ions are seen moving with velocities similar to the neutral outgassing velocity of the order of 1 km/s ( 10 eV), but with their direction and speed influenced by the solar wind electric field. High charge state solar wind ions ($O^{6+}$, $O^{5+}$) are also seen at times. We quantify the super thermal ion environment near a low activity comet and show how it depends on the solar wind intensity and the distance to the sun.