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Rosetta observations of the evolution of the plasma environment of comet 67P

Elias Odelstad (1), Anders Eriksson (1), Niklas Edberg (1), Erik Vigren (1), Pierre Henri (2), Jean-Pierre Lebreton (2), Kathrin Altwegg (3), Martin Rubin (3), Hans Nilsson (4), Marina Galand (5), Chris Carr (5), Emanuele Cupido (5), and Claire Vallat (6)

(1) Swedish Institute of Space Physics, Uppsala, Sweden, (2) Laboratoire de Physique et Chimie de l'Environnement et de l'Espace, Orleans, France, (3) Physikalisches Institut, Universität Bern, Switzerland, (4) Swedish Institute of Space Physics, Kiruna, Sweden, (5) Department of Physics, Imperial College London, London, UK, (6) European Space Agency, ESA/ESAC, Villafranca, Spain

Rosetta provides an unprecedented opportunity to follow the evolution of the plasma environment close to a comet as activity grows and recedes from 4 AU to perihelion and out again. Like the rest of the Rosetta Plasma Consortium (RPC), the Langmuir probe instrument (RPC-LAP) has been operational from early summer 2014 to cover also the approach of Rosetta toward comet 67P/Churyumov-Gerasimenko. As expected, the solar wind dominated early conditions, but as soon as Rosetta came close to the comet, strong signatures of a locally ionized plasma of cometary origin turned up in the data. A particular feature of this early activity cometary plasma is the electron temperature of around 10 eV, much higher than expected for later stages when values several orders of magnitude lower should be seen as the result of collisional cooling by the by then much denser neutral gas in the coma. Another feature is the strong variation with comet rotation, due to inhomogeneous outgassing from the comet. A much weaker long term trend, to which both the increasing solar UV flux at the comet and the slowly increasing outgassing from the comet may contribute, can also be seen in the plasma density as the comet gets closer to the Sun.