Geophysical Research Abstracts
Vol. 18, EGU2016-9903, 2016
EGU General Assembly 2016

Plasma properties at 67P/Churyumov-Gerasimenko: a comparision between PP-SESAME/Philae/Rosetta and RPC/MIP

Walter Schmidt (1), Pierre Henri (2), Jean Pierre Lebreton (2), Xavier Vallières (2), Réjean Grard (3), Michel Hamelin (4), Alice Le Gall (4), Anthony Lethuillier (4), Valerie Ciarletti (4), Sylvain Caujolle-Bert (4), Klaus Seidensticker (5), and Hans-Herbert Fischer ()

(1) Finnish Meteorological Institute, Earth Observation, Helsinki, Finland (walter.schmidt@fmi.fi), (2) CNRS/LPC2E, Orléans ,France, (3) retired from European Space Agency, ESTEC, Noordwijk, The Netherlands, (4) LATMOS - UVSQ, France, (5) DLR Köln, Germany

On November 12, 2014, the Rosetta landing module Philae approached the nucleus of 67P/Churyumov-Gerasimenko and eventually settled on the surface in a location named Abydos, though its exact coordinates are still unknown. The Permittivity Probe (PP) as part of the SESAME (Surface Electric Sounding and Acoustic Monitoring Experiment) instrument package [1] was designed to not only measure the electrical properties of the comet's surface material by actively injecting an alternating current at different frequencies into the material underneath the Lander but also to monitor potential variations between its two receivers and the electrical conductivity of the plasma environment while still in space. By sampling the potential difference at 40 kHz between the soles of two of the feet attached to Philae's landing gear, plasma waves between 20 and 20 000 Hz should be detectable if their amplitudes are large enough. The injection of low frequency currents into the plasma environment during Philae's descent gives indications for changes of the plasma density when approaching the comet.
In this paper we present observations from the cross-calibration campaign with the Rosetta plasma package instrument MIP (Mutual Impedance Probe) [2] during the Pre-Delivery Calibration and Science (PDCS) operations on October 17, 2014, during the descent towards the comet surface on November 12, 2014, and from the First Science Sequence at Abydos on November 13. During the PDCS campaign most PP observation slots coincided with plasma waves dominantly in the 100 to 150 kHz range according to MIP measurements. Accordingly PP did not register any signals. Only in the afternoon of the 17th low frequency waves were recorded by MIP. At the same time the measured PP wave power signal was above the background for frequencies below 500 Hz in several subsequent measurements. During the descent [3] the injected current at 758 Hz dropped suddenly by about 5 % possibly indicating a decrease in the plasma density at an altitude of about 18.5 km above the comet surface. During the First Science Sequence PP was monitoring low frequency wave-like activities starting two hours after local sunset.

References:
[1] K. J. Seidensticker, H-H. Fischer, D. Medlener, S. Schieke, K. Thiel, A. Peter, W. Schmidt and R. Trautner, 2004: The Rosetta lander experiment sesame and the new target comet 67P/Churyumov-Gerasimenko. The New ROSETTA Targets - Observations, Simulations and Instrument Performances, Astrophys. Space Sci. 311, 297-307
[2] J. G. Trotignon et al., RPC-MIP: the Mutual Impedance Probe of the Rosetta Plasma Consortium, Space Science Reviews, February 2007, Volume 128, Issue 1, pp 713-728
[3] H.Krüger et al., Dust Impact Monitor (SESAME-DIM) Measurements at Comet 67P/Churyumov-Gerasimenko, Astronomy&Astrophysics, Volume 583, November 2015, DOI http://dx.doi.org/10.1051/0004-6361/201526400