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A walk around the comet with the Rosetta Plasma Consortium

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Abstract

The Rosetta Plasma Consortium (RPC) instrument package is designed to study: i) the microscopic and macroscopic structure of the interaction region of the comet with the solar wind, ii) the evolution of the development of cometary activity, iii) the inner coma structure, dynamics and aeronomy, and iv) the physical properties of the cometary nucleus and surface. The accommodation of the RPC sensors on the Rosetta spacecraft is illustrated in Figure 1.

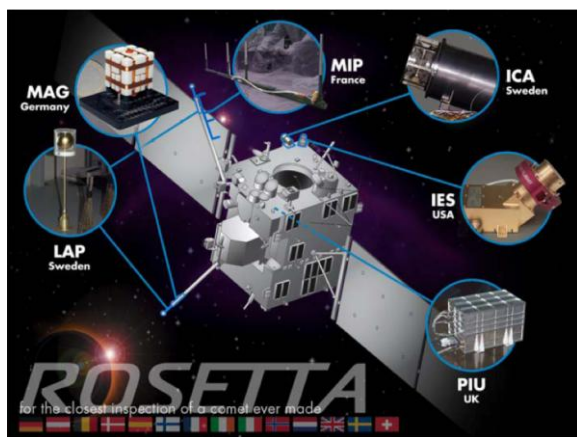


Figure 1: Accommodation of the 5 RPC sensors on board Rosetta.

During Rosetta's approach to its target, comet 67P/Churyumov-Gerasimenko, the RPC instrument suite monitored the comet environment and its interaction with the solar wind. RPC has monitored the plasma signatures of the comet activity nearly continuously since early May 2014. Though the comet is still in a state of low activity, its interaction with the solar wind causes plasma conditions different from standard solar wind characteristics. The five RPC plasma sensors detected signals related to the comet-driven modifications of the solar wind. The first signs of cometary activity were the

detection, in early August, of pick-up cometary ions by the Ion Composition Analyser (RPC-ICA) and the Ion and Electron Sensor (RPC-IES). IES saw increasing electron fluxes, very low energy (perhaps pickup) ions, and energetic negative ions and/or charged ice grains. Magnetic fluctuations and low frequency waves resulting from what is believed to be a new type of Comet-Solar Wind interaction were also detected by the Fluxgate Magnetometer (RPC-MAG). Electron density enhancements, resulting from the ionisation of cometary gas that is mass-loading the solar wind, are also regularly detected by the Langmuir probes (RPC-LAP) and by the Mutual Impedance Probe (RPC-MIP). Large variations of electron density are observed from day to day and sometimes on time scale of hours and even minutes. Examples of RPC measurements will be presented and discussed in context of recent model predictions.

Acknowledgements

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The Rosetta Plasma Consortium (RPC) instrument package consists of 5 sensors (RPC-ICA, RPC-IES, RPC-LAP, RPC-MAG, RPC-MIP) and a control unit (RPC-PIU). RPC is operated by Imperial College London in cooperation with SwRI/San Antonio, IRF/Kiruna, IGeP_TU Braunschweig, IRFU/Uppsala, LPC2E/Orléans. The lead funding agencies are CNES, BMWi and DLR, NASA, SNSB, STFC.

The following institutes were involved during the hardware development phase: FMI/Helsinki, Imperial College London, IGEP/Braunschweig, IRF/Kiruna, IRFU/Uppsala, IRAP/Toulouse, IWF/Graz, KFKI/Budapest, KTH/Stockholm, LPC2E/Orléans, SwRI/San Antonio, University of Oslo, ESA/RSSD.

RPC science team members of the Wigner Research Center for Physics/Budapest, IWF/Graz, NASA Goddard, University of Kansas, and JPL/Pasadena are also actively participating in the science planning process.

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