

Project plan for BSc thesis project work (10 p): "Initial results from the Rosetta LAP instrument"

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Background

Rosetta, launched 2 March 2004, is an ambitious ESA mission for detailed studies of comet Churyomov-Gerasimenko. One of the instruments onboard is the dual Langmuir probe instrument, LAP, designed and built at the Swedish Institute of Space Physics in Uppsala. Rosetta does not arrive at the comet until 2014, but the first LAP data are scheduled to arrive in March 17, 2004, when we start commissioning the instrument. The data gathered during the commissioning period are intended to be used for verification of instrument performance, and will be evaluated from this point of view as a part of the standard instrument commissioning. However, it may also be possible to get some scientific results out of the commissioning data.

All data from Rosetta are to be archived using a standard known as PDS. The LAP data are transformed to PDS format upon arrival in Uppsala. The PDS format includes a header with a complete description of the data, for any scientific study, one will need some software to decode and present the data. In addition, some of the LAP data products (probe bias sweeps, interferometric velocity measurements) requires some analysis to be applied to the data. As the PDS format is very transparent, and the analysis algorithms are well known and previously used within the LAP team, writing routines for browsing data and performing a few standard analysis manoeuvres is a rather small task.

LAP is part of RPC, the Rosetta Plasma Consortium, comprising also other sensors whose data are vital for adequately characterizing the plasma. It is not clear if data from these other RPC instruments will be available during the intended time span of this project. However, what certainly will be available are solar wind data from spacecraft close to Earth, like the ACE solar wind monitor at the L1 Lagrange point, and the Earth orbiting Cluster satellites. Comparing LAP data to what is seen by these spacecrafts will provide a two-point measurement in the solar wind.

Goal

Write a basic browsing and basic analysis tool for LAP PDS data files. Use this to extract physical parameters of the solar wind (density, or at least relative density variations, and temperature). Compare to ACE and/or Cluster data to investigate the azimuthal structure of the solar wind. Some of the results of the project may possibly be included in a later publication from the LAP team, in which case the student would be acknowledged as co-author.

Plan

The work will mainly be done at the Swedish Institute of Space Physics in Uppsala. The work spans the time March - June 2004. Tentative division of available time: 2 weeks for getting started and gathering background knowledge, 3 weeks for writing code, 2 weeks for analyzing data, 3 weeks for writing report. In reality, the tasks cannot be undertaken consecutively: in particular, report writing should start at an early stage.

Supervisor will be Anders Eriksson, principal investigator of LAP. However, since the LAP PDS archiving and all aspects of the data handling are best known by Reine Gill, the LAP software designer, he as well will be involved to a large extent.