

Ion and electron momentum flux observed by Rosetta

SND-ID: snd1163-1. **Version:** 1. **DOI:** <https://doi.org/10.5878/t0r1-2y39>

Download data

ion_electron_mom_flux_Rosetta.csv (220.25 KB)

Metadata file for study SND 1163 - Ion and electron momentum flux observed by Rosetta.pdf (492.19 KB)

Associated documentation

Metadata file for study SND 1163 - Ion and electron momentum flux observed by Rosetta.pdf (492.19 KB)

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snd1163-1-1.zip (~1.18 MB)

Citation

Williamson, H. (2020) Ion and electron momentum flux observed by Rosetta (Version 1) [Data set]. Swedish Institute of Space Physics. Available at: <https://doi.org/10.5878/t0r1-2y39>

Creator/Principal investigator(s)

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Description

Data from the Rosetta mission has been used to study the momentum flux around comet 67P during the two years when the Rosetta spacecraft followed the comet, between August 2014 and September 2016. During this period, the comet first approached the Sun and its atmosphere and ionosphere grew until perihelion was reached. Thereafter the comet move further away from the Sun, and its atmosphere and ionosphere shrunk again. We show how the solar wind affects the comet ionosphere and how its dynamic pressure interacts with the ionosphere of the comet. A significant pressure is built up, magnetic and electron pressure and the momentum flux of cometary ions all become important. Close to the comet the electron pressure dominate, corresponding to a region where an expanding ionosphere can push away the solar wind. Around perihelion a cavity in the solar wind formed, where no solar wind ions are present. There was still a magnetic field, as well as water ions of cometary origin, that had been picked up by the solar wind upstream, and been accelerated back towards the comet. In the solar wind ion cavity these ions are dominating, and their momentum flux approximately corresponds to that of the solar wind outside the cavity. This can be regarded as that they gave taken over the role of the solar wind in for the momentum flux and pressure balance. We also compare with solar wind conditions outside the interaction region with the comet ionosphere, by looking at solar wind data from the vicinity of Earth, propagated to the position of Rosetta. We can see that the total pressure within the comet ionosphere, corresponding to solar wind, cometary ions, magnetic pressure and electron pressure, typically is in pressure balance with the surrounding solar wind, as can be expected. Close to the comet the electron pressure is strongly dominating, one or several orders of magnitude stronger. This may correspond to an expanding comet ionosphere but

probably also an overestimate of the electron pressure in our simplified model.

CSV table of the ion, electron, and magnetic pressure for the time period August 2014 to October 2016. Columns are: mission time, cometary ion x, y, and z components of momentum flux, solar wind ion x, y, and z components of momentum flux, electron pressure, and magnetic pressure. The cometary ion and solar wind ion data was calculated using data from the Rosetta Ion Composition Analyzer. Electron pressure data was calculated from Langmuir probe and Mutual Impedance Probe data. Magnetic pressure data was calculated using magnetometer data. All data has been averaged over 12 hours of mission time.

Data contains personal data

No

Language

[English](#)

Time period(s) investigated

2014-08-01 - 2016-10-01

Variables

9

Data format / data structure

[Numeric](#)

Data collection 1

- Time period(s) for data collection: 2014-08-01 - 2016-10-01

Responsible department/unit

Solar System Physics and Space Technology

Research area

[Natural sciences](#) (Standard för svensk indelning av forskningsämnen 2011)

[Astronomy, astrophysics and cosmology](#) (Standard för svensk indelning av forskningsämnen 2011)

[Meteorology and atmospheric sciences](#) (Standard för svensk indelning av forskningsämnen 2011)

[Climatology / meteorology / atmosphere](#) (INSPIRE topic categories)

Keywords

[Ionosphere/magnetosphere dynamics](#), [Rosetta](#), [Comet](#)

Accessibility level

Access to data through SND

Data are freely accessible

Use of data

[Things to consider when using data shared through SND](#)

Versions

Version 1. 2020-06-30

Contact for questions about the data

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Download metadata

[DataCite](#)

[DDI 2.5](#)

[DDI 3.3](#)

[DCAT-AP-SE 2.0](#)

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