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Singing comet changes its song

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Abstract

The singing comet [Richter et al., 2015] was discovered at the beginning of Rosetta's mission around comet 67P/Churyumov-Gerasimenko. It consists of large-amplitude compressional waves with a frequency in the range of 10 – 100 mHz. One possible description of these waves in a modified ion-Weibel instability [Meier et al., 2016]. Two-point measurements during the Philae landing allowed for determining the wave-number and dispersion of these waves [Richter et al., 2016]. Later in the mission, when the comet became more active, as it moved close to the Sun, the singing disappeared in the data, either because the instability criterion was no longer fulfilled or the signal may have been obscured by other effects.

In this presentation we will discuss observations of two days, 26 and 27 March 2016, during the Rosetta tail excursion, when the spacecraft moved down the tail and from the south to the centre, see Figure 1.

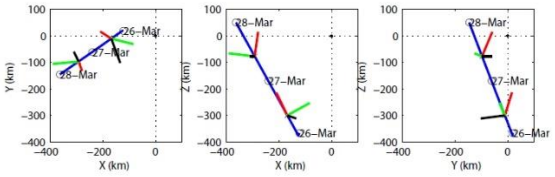

Figure 1: Orbit of Rosetta on 26-27 March 2016. The colored bars on the orbit display the magnetic field direction (black), the minimum variance (red) and maximum variance (green) direction during two intervals of interest.

Spectral analysis of the magnetic field data showed an interesting behaviour of the singing comet waves, as shown in Fig. 2, where the data are transformed to a mean-field aligned system and the transverse components are combined into left- and right-hand polarized components.

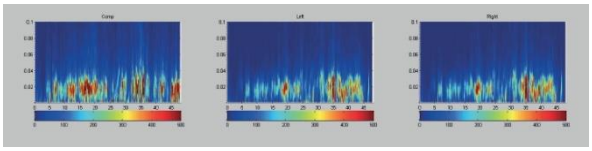

Figure 2: Dynamic spectra of the magnetic field data in a mean-field aligned coordinate system.

The dynamic spectra show strong wave power around 20 mHz, which on 26 March clearly shows a dominant compressional component, whereas on 27 March the left- and right-hand polarization dominates. This indicates that the singing comet changed its song.

Data from the magnetometer and plasma instruments are used to explain this change in wave mode, as well as a dispersion solver.

References

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