Ion velocity map of Saturn’s inner magnetosphere

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The Cassini mission has discovered a plume with mostly water which is expelled from Saturn’s moon Enceladus (e.g., Porco et al., 2006) and this water creates an extended torus around Saturn. The inner magnetosphere consists of a dense and cold plasma in the shape of a disk (Moncuquet et al., 2005; Persoon et al., 2005; Wahlund et al., 2005; Sittler et al., 2006) created by ionization of the water rich torus. From the Radio and Plasma Wave Science (RPWS) observations onboard Cassini, it is revealed that the charged dust in the E-ring interacts with the dense surrounding plasma disk of Saturn, i.e dust-plasma interaction, and two ion populations were inferred; one co-rotating with the planetary magnetosphere and another moving with near Keplerian speed around Saturn (Wahlund et al., 2009).

In order to map the spatial extent of the dust-plasma interaction effects we have analysed the RPWS Langmuir Probe derived ion velocities in the Saturn’s inner magnetosphere. Here we present only the equatorial average ion bulk speed versus distance from Saturn, and compare the observations with rigid co-rotation and Keplerian velocities. The results confirms that the bulk of the ions in the plasma disk is sub-co-rotating out to about 7 R\(_S\) and tend to approach co-rotation at further distances from Saturn. In this presentation, we discuss the importance of dust-plasma interaction in the Saturn’s inner magnetosphere.

References