

Evidence for a Magnetic Pileup Boundary at Titan: New elements for the interpretation of the observations at Mars.

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Abstract:

The measurements obtained by the Cassini magnetometer and plasma instruments during the first flybys of Titan are providing invaluable information on its interaction with Saturn's co-rotating magnetosphere. On one hand, the virtual absence of a significant global magnetic field and the presence of a dense atmosphere make Titan's interaction very similar to the solar wind interaction with Mars, Venus and comets with a magnetic barrier above Titan's ionosphere and a magnetic tail generated from the draping of Saturn's magnetic field, as it passes by the satellite frozen into the co-rotational flow. On the other hand, the diversity of the upstream conditions (especially the variation in the angle between the incoming plasma flow and the solar EUV flux) as Titan moves on its orbit makes it one of the most outstanding laboratories to study the variability of the plasma structures generated by this interaction.

In particular, previous and current studies on the solar wind interaction with Mars, Venus and comets reveal the occurrence a sharp plasma boundary marking the entry into the magnetic barrier and tail lobes: the Magnetic Pileup Boundary (MPB). At these objects, the MPB has been identified from a series of very clear observational signatures including: an increase in the magnetic field magnitude, the enhancement of the magnetic field draping, and strong changes in the local electron distribution and in the dominant ion population, which are attributed to the increasing influence of the body's exosphere. Based in the mentioned signatures, we present evidence in favour of a magnetic pileup boundary at Titan as implied by Cassini magnetic field and plasma data. In addition, we study the structure of this boundary with the intention of providing new elements for the interpretation of past and future observations by MGS, Phobos-2, Mars Express and Rosetta at the Martian MPB.