Geophysical Research Abstracts, Vol. 8, 03211, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03211

The structure of the magnetic pileup boundary of Titan from Cassini observations

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We use Cassini magnetic field and plasma data to study the properties of the external boundary of Titan's induced magnetosphere for several flybys. This boundary is characterized by strong changes in the magnetic field structure and plasma properties. As Cassini crosses this boundary on its way to Titan, it observes an enhancement of the magnetic field draping (for this reason it is usually called draping boundary) which is sometimes accompanied by an enhancement of the magnetic field pileup. At the same time as these magnetic field features occur, Cassini also observes an increase in the plasma density, a cooling of the electron distribution function, and important changes in the dominating ion population, which are attributed to the increasing influence of Titan's exosphere. Because of the previous signatures, this boundary strongly resembles the Magnetic Pileup Boundary (MPB) observed at comets, Mars and Venus, and as in those cases the thickness of Titan's MPB is comparable to the local ion inertial length. Nevertheless, Cassini observations also suggest an asymmetry in the shape of the interaction region with respect to the direction of the convective electric field. We analyze then if this is an indication of an asymmetric massloading (a reasonable idea for heavy ions from Titan with long gyroradii), and, if so, to what extent the structure of Titan's MPB could be affected by this asymmetry.