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On the structure and variability of Titan's magnetic environment

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The magnetic field and plasma measurements obtained by Cassini so far show that Titan's interaction with Saturn's magnetosphere is more complex than initially thought. In this work, we use Cassini magnetometer and plasma data in an attempt to characterize the plasma environment encountered by Titan along its orbit and the structure of the satellite's induced magnetosphere. First, we find that the proximity of Titan's orbit to the dynamic Kronian magnetodisk leads to significant changes in the background magnetic field, the plasma density, temperature, and the incoming plasma flow direction at different timescales. Furthermore, we conclude that this factor is as important as the variability associated with the difference between the EUV flux and the magnetospheric flow directions along Titan's orbit. Second, analyses of Cassini magnetic field and plasma data obtained at similar Saturn local times suggest the presence of regions of weak and strong magnetic field draping. We claim that these correspond to an outer weak and an inner strong massloading region respectively. The strong draping region is in fact Titan's induced magnetosphere and it is enclosed by a magnetic pileup boundary as found at comets, Mars and Venus.