



## **Lifetime of the Fossil Field in Titan's Ionosphere**

Yingjuan Ma (1), Christopher T. Russell (1), Hanying Wei (1), Andrew F. Nagy (2), Gabor Toth (2), Michele K. Dougherty (3), Andrew J. Coates (4), Jan-Erik Wahlund (5), and Niklas J.T. Edberg (5)

(1) United States (yingjuan@igpp.ucla.edu), (2) University of Michigan, Ann Arbor, MI, USA, (3) The Blackett Laboratory, Imperial College, London, UK, (4) Mullard Space Science Laboratory, University College London, London, UK, (5) Swedish Institute of Space Physics, Uppsala, Sweden

Cassini spacecraft has made more than 100 Titan flybys since October 2004. Among these flybys, there are a few special ones (T32, T42, T85, T96). During or shortly before periapsis on these encounters, Titan was found to be outside the Saturnian magnetosphere, in the magnetosheath region or directly exposed in the solar wind. During the T32 flyby, the first magnetosheath encounter, simulation results and observations clearly demonstrated the existence of fossil field, because the magnetic field direction in the magnetosheath region was opposite to the field orientation surrounding Titan when it had been inside the Saturnian magnetosphere. However, because Cassini passed by Titan shortly after the magnetopause crossing, this flyby only provides a lower limit of the lifetime of the fossil field. Quantifying the lifetime of the fossil field has important implications for understanding the magnetic field of other Titan flybys. Since the plasma is highly dynamic in Saturn's outer magnetosphere, even though the ambient plasma condition is not changing as dramatically as discussed in the presented flyby, Titan's ionosphere could still record some of those changes so that the observed field in the deep ionosphere might have very complicated signatures. The same behavior could also occur at Venus and Mars (in the weak crustal field region), which would help us to understand the complicated magnetic signatures in un-magnetized planetary ionospheres. In this paper, we present observations and simulation results for the other three Titan flybys to provide a better constraint on the lifetime of the fossil field in Titan's ionosphere.