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3D hybrid simulation of the Titan's plasma environment

ALEXANDER LIPATOV, GEST Center UMBC, EDWARD SITTLER JR., RICHARD HARTLE, NASA GSFC — Titan plays an important role as a simulation laboratory for multiscale kinetic plasma processes which are key processes in space and laboratory plasmas. A development of multiscale combined numerical methods allows us to use more realistic plasma models at Titan. In this report, we describe a Particle-Ion-Fluid-Ion-Fluid-Electron method of kinetic ion-neutral simulation code. This method takes into account charge-exchange and photoionization processes. The model of atmosphere of Titan was based on a paper by Sittler, Hartle, Vinas et al., [2005]. The background ions H^+ , O^+ and pickup ions H_2^+ , CH_4^+ and N_2^+ are described in a kinetic approximation, where the electrons are approximated as a fluid. In this report we study the coupling between background ions and pickup ions on the multiple space scales determined by the ion gyroradii. The first results of such a simulation of the dynamics of ions near Titan are discussed in this report and compared with recent measurements made by the Cassini Plasma Spectrometer (CAPS, [Hartle, Sittler et al., 2006]).

E C Sittler Jr., R E Hartle, A F Vinas, R E Johnson, H T Smith and I Mueller-Wodarg, *J. Geophys. Res.*, 110, A09302, 2005.

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Alexander Lipatov
GEST Center UMBC

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