

## 3D hybrid simulation of the Titan's plasma environment

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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 (see, e.g. [Lipatov, 2002]). 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]).

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