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Simulation of the Jovian magnetospheric plasma interaction with Ganymede's magnetosphere: preliminary developments

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Ganymede is the only natural satellite known to have its own magnetosphere in the solar system. Its internal magnetic field interact strongly with the jovian magnetospheric plasma composed of oxygen ions and protons. The corotating jovian plasma has a low beta parameter and is sub-sonic and sub-alfenic with a plasma bulk flow at about 180 km/s. Few MHD models have been successfully developed to simulate this interaction however a kinetic approach is more appropriate to describe the dynamic of high gyroradii ions existing in Jovian magnetospheric plasma. Therefore a 3D multi-species hybrid model is currently in development. In the hybrid formalism electrons are treated as inertialess neutralizing fluid while a kinetic description is adopted for ions. The core of the simulation model is based on the CAM-CL algorithm (Matthews, 1994) and it has been largely used to model solar wind interaction with weakly magnetized bodies, such as, Mars, Venus or Titan. Galileo observations have been used to set up the jovian magnetospheric plasma, Ganymede's magnetic moment, and boundary condition. Preliminary simulation results, including a ionospheric plasma resulting of sputtering and evaporation from Ganymede's surface, are discussed.