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Ganymede's interaction with the jovian plasma from hybrid simulation

Ronan Modolo¹, Claire Baskevitch², Francois Leblanc², and Adam Masters³

¹University of Versailles / LATMOS, LATMOS, GUYANCOURT, France (ronan.modolo@latmos.ipsl.fr)

²LATMOS / CNRS, LATMOS, Paris, France

³Imperial College, Department of Physics, LONDON, England

The JUICE (JUperiter ICy moon Explorer) mission, selected by the European Space Agency in May 2012 to be the first large mission within the Cosmic Vision Program 2015–2025, will provide the most comprehensive exploration to date of the Jovian system in all its complexity, with particular emphasis on Ganymede as a planetary body and potential habitat (JUICE Red Book, 2014). The Galilean satellites are known to have thin atmospheres, technically exospheres (McGrath et al., 2004), produced by ion-induced sputtering and sublimation of the surface materials. These moons and tenuous atmosphere are embedded in the flowing plasma of the jovian. The interaction between the neutral environments of the Galilean satellites and the jovian plasma changes the plasma momentum, the temperature and generates strong electrical currents. In order to prepare the scientific return of the mission and the optimization of operation modes of plasma instruments, a modeling effort has been carried out at LATMOS (PhD R. Allieux, IRAP, 2012; L. Leclercq, LATMOS, 2015; O. Apurva, LATMOS, 2017). A 3D parallel multi-species hybrid model (Latmos Hybrid Simulation, LatHyS) has been developed to model and characterize the plasma environment of Ganymede (Leclercq et al, 2016; Modolo et al, 2016) and a 3D parallel multi-species exospheric model (Exospheric Global Model, EGM) to pattern the dynamic of the neutral envelopes of Ganymede (Turc et al, 2014; Leblanc et al, 2017). The presentation will examine the global structure of the interaction with the jovian plasma, to describe the formation of Alfvén wings, and to emphasize the phenomena related to the multi-species nature of the plasma. The simulation model supports the preparation of the JUICE mission and its Ganymede phase by characterizing boundary crossings.