

Multi-species hybrid modeling of plasma interactions at Galilean moons

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We study the plasma interactions of Galilean satellites by means of multi-species global hybrid simulations. We consider multi-species background plasma composed of oxygen and sulfur ions and multi-component neutral atmospheres. Further we consider ionization processes of the neutral atmosphere which is then a source of dense population of pick-up ions. We apply variable background plasma conditions (density, temperature, magnetic field magnitude and orientation) in order to cover the variability in conditions experienced by the satellites when located in different regions of the Jovian plasma torus. We examine global structure of the interactions, formation of Alfvén wings, development of temperature anisotropies and corresponding instabilities, and the fine phenomena caused by the multi-specie nature of the plasma. The results are in good agreement with in situ measurements of magnetic field and plasma density made by the Galileo spacecraft.