Voyager 2 Encounter with Ganymede's Wake: Hydromagnetic and Electrodynamic Process

Gul F. Tariq, April 1984
Islamabad, Pakistan

Voyager 2's passage through corotation wake region of Ganymede found disturbances in the energetic particle and magnetic field data. To explain the nature of disturbances, an investigation of the interaction of the Jovian plasma with Ganymede is carried out. A series of computer simulations, supported by appropriate theories, are made. Three different aspects of the interaction are studied: (i) A magnetic field model is proposed to describe Alfvenic disturbances caused by Ganymede. Numerical simulations show that the interaction of ensembles of ions with perturbed fields modulates the energies of the ions. The amount of modulations depends on the Alfven mach number of the ambient plasma, the ion energy and the pitch angle of the ions. (ii) The electrodynamic processes associated with the plasma–Ganymede interaction and the plasma expansion into the cavity are simulated using a particle–in–cell method. The distribution of ions, potentials, ion and electron thermal and drift energies in the wake region are obtained. (iii) Using linear MHD theory, conditions for excitation and growth of the Kelvin–Helmholtz instability are investigated. Theoretical conditions for the existence of magnetosonic waves and transverse Alfven waves are also examined.