SPECIAL P/SS Department Colloquium

Plasma and Magnetic Field Environments of Jupiter's Galilean Satellites

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Friday, March 14, 2014
OPS 140
4:00 – 5:00pm

Meet and Greet
OPS 140
3:00 - 4:00pm

The four Galilean satellites of Jupiter, Io, Europa, Ganymede and Callisto, exhibit great diversity in their magnetic properties and in the nature of their interactions with Jupiter's magnetospheric plasma. Due to surface warming, active plumes, and/or surface sputtering by charged particles, the Galilean moons serve as significant sources of neutral gases and ionized particles that mass-load the background Jovian plasma and thus create significant electromagnetic perturbations over volumes large compared with their sizes. It is now known based on in-situ magnetic field measurements that each of the four Galilean moons harbors a global sub-surface liquid layer that generates magnetic field inductively in response to Jupiter's time-varying magnetospheric field. As the largest moon in the solar system, Ganymede presents a unique example of a strongly magnetized moon. The intrinsic magnetic field of Ganymede is sufficiently strong that it powers a mini-magnetosphere of its own embedded in the giant Jupiter's magnetosphere. In this presentation, I will give an overview of the various forms of plasma interaction with the Galilean satellites as revealed by spacecraft observations and numerical modeling. I will explain how physics-based computer simulations have helped characterize the plasma and magnetic field environments of the moons and thus enabled us to develop useful constraints on the physical states of the moons' interiors. Prospects for future space missions to the Jupiter system, such as the Jupiter Icy Moon Explorer (JUICE) mission, will also be discussed.