

Plasma IMS Composition Measurements for Europa and Ganymede

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Abstract

NASA and ESA are planning the joint Europa Jupiter System Mission (EJSM) to the Jupiter system with specific emphasis to Europa and Ganymede, respectively. The Japanese Space Agency is also planning an orbiter mission to explore Jupiter's magnetosphere and the Galilean satellites. For NASA's Jupiter Europa Orbiter (JEO) we are developing the 3D Ion Mass Spectrometer (IMS) with two main goals which can also be applied to the other Galilean moons, 1) measure the plasma interaction between Europa and Jupiter's magnetosphere and 2) infer the 4π surface composition to trace elemental [1] and significant isotopic levels. The first goal supports the magnetometer (MAG) measurements, primarily directed at detection of Europa's sub-surface ocean, while the second gives information about transfer of material between the Galilean moons, and between the moon surfaces and subsurface layers putatively including oceans. The measurement of the interactions for all the Galilean moons can be used to trace the *in situ* ion measurements of pickup ions back to either Europa's or Ganymede's surface from the respectively orbiting spacecraft. The IMS instrument, being developed under NASA's Astrobiology Instrument Development Program, would maximally achieve plasma measurement requirements for JEO and EJSM while moving forward our knowledge of Jupiter system composition and source processes to far higher levels than previously envisaged.