Geophysical Research Abstracts
Vol. 16, EGU2014-13471-1, 2014
EGU General Assembly 2014

JUICE: complementarity of the payload in adressing the mission science objectives

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JUpiter ICy moons Explorer (JUICE) will perform detailed investigations of Jupiter and its system with particular emphasis on Ganymede as a planetary body and potential habitat. The overarching theme for JUICE is: The emergence of habitable worlds around gas giants. At Ganymede, the mission will characterize in detail the ocean layers; provide topographical, geological and compositional mapping of the surface; study the physical properties of the icy crusts; characterize the internal mass distribution, investigate the exosphere; study Ganymede's intrinsic magnetic field and its interactions with the Jovian magnetosphere. For Europa, the focus will be on the non-ice chemistry, understanding the formation of surface features and subsurface sounding of the icy crust over recently active regions. Callisto will be explored as a witness of the early solar system.

JUICE will perform a multidisciplinary investigation of the Jupiter system as an archetype for gas giants. The circulation, meteorology, chemistry and structure of the Jovian atmosphere will be studied from the cloud tops to the thermosphere. The focus in Jupiter's magnetosphere will include an investigation of the three dimensional properties of the magnetodisc and in-depth study of the coupling processes within the magnetosphere, ionosphere and thermosphere. Aurora and radio emissions will be elucidated. JUICE will study the moons' interactions with the magnetosphere, gravitational coupling and long-term tidal evolution of the Galilean satellites.

JUICE highly capable scientific payload includes 10 state-of-the-art instruments onboard the spacecraft plus one experiment that uses the spacecraft telecommunication system with ground-based radio telescopes. The remote sensing package includes a high-resolution multi-band visible imager (JANUS) and spectro-imaging capabilities from the ultraviolet to the sub-millimetre wavelengths (MAJIS, UVS, SWI). A geophysical package consists of a laser altimeter (GALA) and a radar sounder (RIME) for exploring the surface and subsurface of the moons, and a radio science experiment (3GM) to probe the atmospheres of Jupiter and its satellites and to perform measurements of the gravity fields. An in situ package comprises a powerful particle environment package (PEP), a magnetometer (J-MAG) and a radio and plasma wave instrument (RPWI), including electric fields sensors and a Langmuir probe. An experiment (PRIDE) using ground-based Very-Long-Baseline Interferometry (VLBI) will provide precise determination of the moons ephemerides.

The instruments will work together to achieve mission science objectives that otherwise cannot be achieved by a single experiment. For instance, joint J-MAG, 3GM, GALA and JANUS observations would constrain thickness of the ice shell, ocean depth and conductivity. SWI, 3GM and UVS would complement each other in the temperature sounding of the Jupiter atmosphere. The complex coupling between magnetosphere and atmosphere of Jupiter will be jointly studied by combination of aurora imaging (UVS, MAJIS, JANUS) and plasma and fields measurements (J-MAG, RPWI, PEP). The talk will give an overview of the JUICE payload focusing on complementarity and synergy between the experiments.