EPSC Abstracts,
Vol. 4, EPSC2009-670, 2009
European Planetary Science Congress,

Surface/subsurface in situ measurements relevant for the Astrobiology of Europa and Ganymede

O. Prieto-Ballesteros (1)

(1) Centro de Astrobiología-INTA-CSIC, Torrejón de Ardoz, Spain (prietobo@inta.es / Fax: +34915201074)

Abstract

Astrobiological exploration of Jovian satellites may not be restricted to the remote observation of the surface because: 1) The habitable environments are predictively in the subsurface, where the liquid water may be present in Europa, Ganymede or Callisto. 2) The surfaces of the satellites are affected by a strong radiation environment where many materials, including organic molecules, may not remain unaltered for a long time. If the aqueous reservoirs are linked with the surface, by fractures for instance, materials indicative of the habitability may ascend from the interior. But those materials, once exposed on the surface will be perturbed and may loose the signatures from the potential habitable environment. So, remote measurements would be from secondary materials. 3) Concentration of biosignatures at the surface must be enough for remote detection. Therefore, it is mandatory to reach the surfaces of these icy satellites and be able to observe the subsurface as deeper as possible in the areas suspected to be connected to the liquid water.

Measurements with different complexity could be done depending on the capabilities of the in situ element (impactor, penetrator or lander). Two main goals concerning Astrobiology may be proposed for the mission with an in situ element:
a) Characterization of the potential habitable environment from samples related to the deep interior. Physical-chemical properties which constraints the original aqueous solution, such as conditions of pH and redox, temperature, conductivity, or composition should be obtained. Sampling and icy-mixtures melting are preferable for analysis, which should be done inside the instrumentation. b) Searching for biosignatures, such us organic compounds related to life or isotopic rates. Bio-molecules and biological structures may be modified during rising from the aqueous reservoirs.

Some experiments concerning depressurization of materials when rise to the subsurface levels are being performed. Raman spectroscopy is being used as the analytical technique.