**The near surface radiation environment of Europa, biosignature destruction and implications for in-situ sampling.** T. A. Nordheim[1] (nordheim@jpl.nasa.gov), C. Paranicas[2], K.P. Hand[1], [1]Jet Propulsion Laboratory, California Institute of Technology. [2]Applied Physics Laboratory, John Hopkins University

Jupiter's moon Europa is embedded deep within the Jovian magnetosphere and is thus exposed to bombardment by charged particles, from thermal plasma to more energetic particles at radiation belt energies. In particular, energetic charged particles are capable of affecting the uppermost layer of surface material on Europa, in some cases down to depths of several meters [1][2][3]. Examples of radiation-induced surface alteration include sputtering, radiolysis and grain sintering; processes that are capable of significantly altering the physical properties of surface material. Radiolysis of surface ices containing sulfur-bearing contaminants from Io has been invoked as a possible explanation for hydrated sulfuric acid detected on Europa's surface[4][5] and radiolytic production of oxidants represents a potential source of energy for life that could reside within Europa's sub-surface ocean [6][7][8][9]

Accurate knowledge of Europa's surface radiation environment is essential to the interpretation of space and Earth-based observations of Europa's surface and exosphere. Furthermore, future landed missions may seek to sample endogenic material emplaced on Europa's surface to investigate its chemical composition and to search for biosignatures contained within. Such material would likely be sampled from the shallow subsurface, and thus, it becomes crucial to know to which degree this material is expected to have been radiation processed.

Here we will present modeling results of energetic electron and proton bombardment of Europa's surface, including interactions between these particles and surface material. In addition, we will present predictions for biosignature destruction at different geographical locations and burial depths and discuss the implications of these results for surface sampling by future missions to Europa's surface.

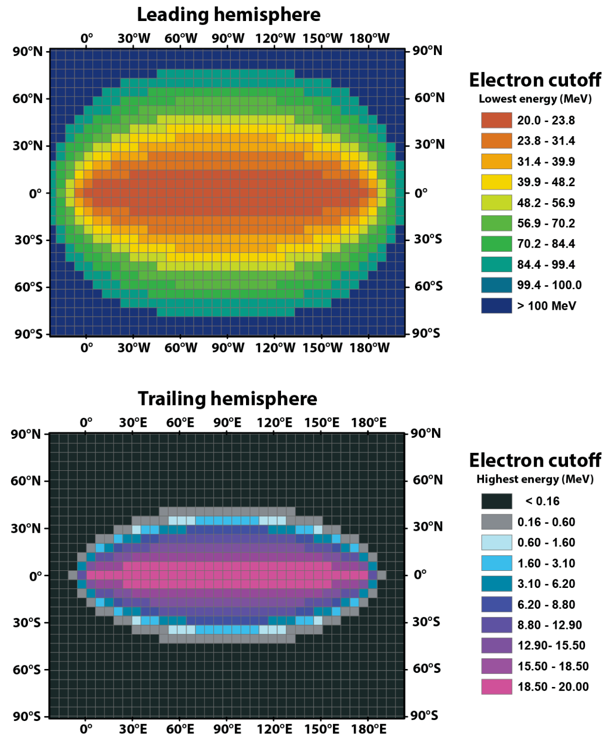


**Figure 1 – Electron access to the surface of Europa.** At the leading hemisphere (top), the cut-off energy represents the lowest energy electrons capable of accessing a region on the surface. At the trailing hemisphere (bottom), the cut-off energy represents the highest energy electron capable of accessing a region on the surface.

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