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Microbial habitability of Europa sustained by radioactive sources

Thiago Altair (PG),[1,2] Marcio G. B. de Avellar (PQ),[3] Fabio Rodrigues (PQ),[4] Douglas Galante (PQ),[1]

douglas.galante@lnls.br; thiago.ferreira@lnls.br

[1]Laboratório Nacional de Luz Síncrotron, CNPEM; [2]Programa de Pós-Graduação em Física Biomolecular, IFSC-USP; [3]Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP, [4]Instituto de Química, USP

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Highlights

Water radiolysis can sustain a microbial ecosystem on the Jupiter`s moon Europa. It can can provide the chemical disequilibrium for the maintenance of life. Radiolysis can be a complementary energy source to hydrothermal activity.

Resumo/Abstract

In this work, it is presented the feasibility of microorganisms like the *bacterium Candidatus Desulforudis audaxviator*, an extremophile found in a gold mine in South Africa surviving at depths up to 4 km, with temperatures between 45^{o}C and 60^{o}C, few nutrients available and some concentration of radioactive minerals such as uraninite, to survive in satellites or in planets like the Jovian moon Europa by extracting energy from the radioactive decay of uranium, thorium and potassium. Knowing the metabolic demands of *Candidatus Desulforudis audaxviator*, a simple ecosystem model is proposed with the basic ingredients to support this kind of microbial life. The Jovian moon Europa was chosen as a potential target to apply this model of ecosystem, due to the similarity of environments. Our study shows that, depending on the availability and state of the pyrite, the radiolytic habitability of Europa is possible, in a complementary way to the hydrothermal habitability. However, this case would be strongly dependent on the concentration of 40K of the oceans or on the seabed. The model also has a variety of modelling parameters that can be further constrained by future space missions to the Jovian system, thus allowing a better understanding of the capacity of the moon to sustain microbial life on its deep environments.