Under pressure: defining the limits of microbial life in ocean worlds

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Abstract

"Ocean Worlds" are defined as planetary bodies with a current liquid ocean. This includes planet Earth, as well as icy moons of the outer solar system: Saturn's moon Titan and Jupiter's moons Ganymede and Europa. While microbial life is found on Earth in the deepest parts of the ocean and in the subseafloor, oceans on icy moons represent targets of future NASA and ESA missions to look for potential life. Pressure increases as a function of depth in ocean worlds, however, the range of pressures encountered in icy moons' oceans is much larger than in Earth's ocean. On Earth, pressure is known to affect the physiology and metabolism of microorganisms. **The goal of this project is to define the limits of microbial activity under high hydrostatic pressure.** We will study the effects of pressure on microbial sulfate reduction, which is an important microbial process for the biogeochemical cycles of C, S and Fe in deep anoxic environments on Earth. It is also a process of interest from an astrobiological point of view due to the availability of sulfate and organic molecules in other ocean worlds. We will use the sulfate-reducing bacterium *Desulfovibrio hydrothermalis* AM13 as model organism to determine as a function of pressure 1) growth rates and survival of SRB and 2) microbial sulfate reduction rates and yields. These results will help us evaluate how deep microorganisms influence biogeochemical cycles on Ocean Worlds.