# Fluids from the ocean crust support life in the deep biosphere

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Crustal fluids represent bottom-seawater that circulate within the porous oceanic crust. They are altered by microbial and water-rock interactions, but still contain electron acceptors for microbial respiration. Owing to the worldwide expansion of the crustal aquifer, it is assumed that these water masses may fuel the marine deep biosphere on a global scale. To examine the importance of crustal fluids in driving the deep biosphere, sediments were recovered during IODP Exp. 301 at a hydrologically active flank of the Juan de Fuca Ridge (northeast Pacific).

At IODP Site U1301, sulfate-containing fluids diffuse from the basalt into overlying sediments, forming a transition zone where sulfate meets *in situ*-produced methane. Enhanced cell counts and metabolic activities suggest that this deep sulfate pool stimulates microbial respiration, specifically anaerobic oxidation of methane coupled to sulfate reduction. Additionally, cell counts, sulfate reduction rates and exoenzyme activities were elevated towards the sediment-basement interface [1].

In a cultivation study, we were able to isolate several sulfate reducers from basement-near sediments (250-260 mbsf). All strains from these fluid-influenced horizons were non-sporeforming, indicating that their populations are active and alive. Incubation experiments under elevated temperatures (45 °C) and *in-situ* pressure (30 MPa) revealed their adaptation to conditions originally found in their habitat. Interestingly, the next cultivated relative of one of our strains (*Desulfovibrio aespoeensis*) was previously described as a typical inhabitant of a deep granitic rock aquifer, confirming similarities between the marine and the terrestrial deep biosphere.

[1] Engelen and Ziegelmüller et al. (2008) Geomicrobiol. J. 25:56-66

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