Serpentinization and its implications for subseafloor habitability and microbial dispersal

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Microbes use reduced gases generated during serpentinization as a source of metabolic energy. However, within the temperature limits of life serpentinization fluids are strongly alkaline and depleted in nutrients and electron acceptors for metabolic reactions[1]. Subseafloor mixing of hydrothermal fluids with seawater is believed to provide the energy and substrates needed to support autotrophic microorganisms[2]. Despite the implications for the distribution and dispersal of microbial life on Earth, our understanding of such environments remains incomplete. A recent study of drill cores from the Iberia Margin examined fossilized microbial communities and fluid mixing processes in the subseafloor of a Cretaceous 'Lost City'-type hydrothermal system at the passive Iberia Margin[3]. Brucite and calcite co-precipitated from mixed fluids within steep chemical gradients between weathered, carbonate-rich serpentinite breccia and serpentinite. Fluid mixing created a habitable environment for microbes within the shallow oceanic basement as indicated by fossilized microbial colonies within these rocks[3]. The exposure of mantle rocks to seawater during the breakup of Pangaea fueled microbial communities at the Iberia Margin. Subsequent seafloor spreading in the North Atlantic has been slow since the Cretaceous[4] and likely involved the exhumation of olivine-rich rocks causing serpentinization. Microbes may have followed the energy as new peridotite is exposed to seawater near the ridge axis, suggesting that slow-seafloor spreading represents a means of microbial dispersal over geological timescales.

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