

zation of ultramafic rocks by meteoric waters may be similar to those present during early Earth (and other telluric planet) formation and could be a common means for producing precursors of anaerobic organisms that may represent the earliest life forms on Earth.

Present-day serpentinization of ultramafic mantle rocks by meteoric groundwater, Bay of Islands Ophiolite Complex, Newfoundland

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The Bay of Islands Ophiolite Complex is a well preserved ophiolite complex comprising rocks of the oceanic crust and mantle located in western Newfoundland. The mantle peridotite from the complex exposed on the mountains of the Tablelands is composed largely of the minerals olivine [(Mg,Fe)₂SiO₄] and pyroxene [(Ca,Mg,Fe)₂Si₂O₆] which are unstable near the Earth's surface and react with H₂O and CO₂ (serpentinization) in near surface environments producing Mg–HCO₃-type waters. Reaction of Mg–silicate and these Mg–HCO₃-waters out of contact with the atmosphere consumes H⁺ and leads to the precipitation of magnesite and dolomite. The waters formed from these reactions are progressively richer in Ca and OH⁻, are supersaturated with respect to brucite, serpentine and diopside, and have a high pH of c. 12. When these Ca–OH-type waters flow near the surface and mix with Mg–HCO₃-waters and the atmosphere, they precipitate calcite and dolomite in near surface veins and carbonate cement in unconsolidated sediments and travertine. The Ca–OH-type waters are incompatible with minerals in adjacent country rocks and form a Ca–rich metasomatic zone or rodingite assemblage along the contact.

The metamorphic change from olivine (Fe²⁺) to magnetite (Fe³⁺) during serpentinization occurs at temperatures <200°C and creates a highly reducing environment leading to the reduction of water to H₂ and abiotic production of hydrocarbons (graphite & methane). Similar elevated abiotic hydrocarbon concentrations have been reported from submarine ultramafic hosted systems in which geological, chemical and biological processes are intimately interlinked and support dense microbial communities. The conditions associated with serpenti-