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Active CO_2 Mineralization in the Bay of Islands Ophiolite Complex, Newfoundland, Canada

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The thermodynamic instability and unique chemistry of ophiolites make them theoretically ideal sites for carbon mineralization. Within fracture networks, the circulation of meteoric waters generates basic and ultra-basic fluids capable of precipitating magnesium and calcium carbonates. Enhancing the rate at which these waters are generated, and form carbonates could be a significant sink for atmospheric CO_2. The goals of this study were to discover natural occurrences of carbonate precipitation in ophiolitic rocks of the Bay of Islands Complex (BOIC), NL, Canada, and to preform laboratory experiments enhancing the rate of carbon mineralization.

Partial exploration of BOIC revealed substantial calcium carbonate travertines and hydromagnesite mounds. Geochemical characterization and *in-situ* measurements indicate that CO_2 is actively being sequestered by the ophiolitic massif. Radiocarbon dating indicates that ultra-basic springs associated with calcium carbonates have been active for over 5000 years, while groundwater seepages at hydromagnesite deposits have been active for over 200 years. On going work includes estimating the amount, and rate, of CO_2 mineralization of the BIOC.

Laboratory experiments paired with a carbon mass balance model were used to determine the rate of CO_2 sequestration and the fate of atmospheric CO_2 in a closed system. In the closed batch chamber, crushed ultramafic rock from the BOIC site was combined with simulated basic and ultra-basic groundwaters. A CO_2 analyzer was connected to the chamber, which monitored headspace CO_2 concentrations. In simulated basic water experiments 30% of the headspace CO_2 was sequestered in 4-hours however the precipitation of carbonates was not detected. In simulated ultra-basic water experiments 70% of headspace CO_2 was removed from the headspace and 60% of the removed CO_2 precipitated as solid calcium carbonate during the four-hour period.