Fragmentation and Carbonation of Serpentinized Dunites

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Mineral carbonation has been suggested as an option for long term sequestration of anthropogenic CO2[1]. It is in this respect critical to know whether the growth of carbonate minerals will clog pore space, and thus limit further transport of CO2 into the rock, or whether the carbonate growth will exert enough stress on the host rock to make it fracture, thus forming new fluid pathways.

In this work, we perform a numerical study of field data from the weathering process in a sub-arctic serpentinized dunite in the Feragen Ultramafic Body (FUB) in eastern Norway. We present how chemical processes are weakening the rock mechanically by dissolving brucite contained in the serpentine, and how carbonate minerals readily fracture the weakened rock.

We achieve an improved understanding of how coupled chemical and mechanical processes can increase the rate of weathering and carbonation, thus improving our ability to determine whether industrial scale mineral carbonation is a viable option for long term storage of CO2.

[1] Kelemen, P. B., and Matter, J., (2008) Proceedings of the National Academy of Sciences of the United States of America, Vol. 105 (45): pp. 17295 - 17300