Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22201

Quantification of carbon dioxide removal via growth of *Bluetime* peas in basalt amended soil

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Understanding the processes that contribute to silicate weathering in soils is crucial for robust monitoring, reporting, and verification (MRV) of CO_2 removal by enhanced rock weathering (ERW).

To complement ERW field trials being undertaken on arable farmland in Harpenden, UK, we have conducted a controlled soil-plant mesocosm experiment to closely explore the processes that regulate ERW rates in Harpenden soils. Crushed basalt (from the Harpenden trials) was tilled into the upper 15cm of soil (also from Harpenden) in weathering mesocosms at application rates of 0t/ha (control), 100 t/ha, and 400 t/ha, and *Bluetime* pea seeds were sown. The mesocosms were housed in a controlled environmental growth chamber and irrigated with deionized water (~250 mL every 3 days). As per field practise, the peas were allowed to dry on the plant and were harvested 112 days after the seeds were sown in the mesocosms. Soil drainage waters were collected once a week, and plant material and soils were collected at the end of the experiment.

We present initial results from geochemical analyses of the applied basalt, the soil drainage waters and soils collected at the start and end of the experiment. Higher drainage water pH was observed over the first ~40 days in both the 100 t/ha (6.90 ± 0.05) and 400 t/ha (7.00 ± 0.07) treatments relative to the control (6.74 ± 0.04). Differences in pH between treatments were maintained over the course of the experiment, although pH in both the control and 100 t/ha mesocosms declined after ~40 days. Preliminary data shows increased alkalinity export in both basalt-amended mesocosms, averaging 278 ± 82 uEq/L (100 t/ha) and 447 ± 65 uEq/L (400t/ha) over the first 35 days of the experiment. While this increase in alkalinity was observed throughout the whole 400 t/ha treatment experiment, alkalinity enhancement was not observed in the 100 t/ha treatment after ~60 days. By combining alkalinity measurements with analyses of cation ratios we quantify CDR associated with carbonic acid weathering of the applied basalt. We also explore (i) the potential for release of unwanted metals, and (ii) retention of released cations on soil exchangeable sites.