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Harnessing enhanced rock weathering in a forestry context

Gregory Jones[1], Athanasios Paschalis[2], and Bonnie Waring[1]
[1]Imperial College London, Department of Life Sciences and Grantham Institute, London, UK
[2]Imperial College London, Department of Civil and Environmental Engineering and Grantham Institute, London, UK

Currently, few scalable, cost-effective CO_2 removal (CDR) strategies exist to mitigate anthropogenic climate change. Enhanced rock weathering (ERW) is a strategy in which finely ground silicate rock reacts with atmospheric CO_2 and produces weathering products that are transported to the ocean for long-term storage. Despite detailed knowledge of chemical weathering and its role in the carbon cycles at geologic timescales, few data display the efficacy of ERW for CDR at timescales appropriate for climate mitigation. To address this, we use the first large-scale field trial of ERW combined with tree planting at an afforestation experiment in mid-Wales. A factorial experimental design will enable us to determine the influence of basalt application and tree functional type on rock weathering and nutrient cycling parameters, such as soil pore water pH, alkalinity, cation concentrations and soil carbon. Here, we focus on the description and installation of the experiment, its monitoring protocol, and data analysis from the first two years of the site observations. We also outline how the data can be introduced into a mechanistic eco-hydrological model. Ultimately, we aim to synthesize these findings to inform predictions of global regions where ERW could be most effective for CDR.