

How the lab-field discrepancy in mineral weathering affects predictions of rates of enhanced rock weathering

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For many decades it has been observed that rates of mineral reaction appear slower in field settings than when measured in the laboratory. Since the 1980s, many researchers have proposed explanations for the discrepancy. They have also catalyzed observational advances in measurement of field and lab systems as well as theoretical advances for modelling mineral-water reaction kinetics at different temporal and spatial scales. The lab-field discrepancy has great relevance today because weathering of silicates (especially basalts) has been proposed as a negative emission technology for removal of CO₂ from the atmosphere. Such enhanced rock weathering relies on mining and grinding silicate rock for dispersal on farmland to enable weathering by carbonic acid. I will review why field rates are slower than lab rates and then explore implications of the lab-field discrepancy with respect to enhanced rock weathering. Published measurements in the literature for enhanced rates of basalt weathering in croplands will be summarized and compared to laboratory rates, and rationalized in the context of the summarized lab-field discrepancy.