Influence of *Phaseolus vulgaris* grown in elevated CO_2 on apatite dissolution

BRIAN M. MORRA[1] AND AMANDA ALBRIGHT OLSEN[1*]

[1]University of Maine School of Earth and Climate Sciences, Orono, ME 04469, USA (brian.morra@maine.edu; *correspondence amanda.a.olsen@maine.edu)

Elevated concentrations of atmospheric CO_2 create changes in plant morphology, growth rate, and exudate production. This study sought to quantify the effect of these changes on soil mineral weathering using plants grown under two conditions, ambient CO_2 (400ppm) and elevated CO_2 (~1000 ppm). *Phaseolus vulgaris* (common bean) was grown in flow-through microcosms containing a mixture of quartz and apatite sands. Plant growth was sustained by a nutrient solution lacking in Ca and P. Ca and P content of the leachate and plant tissue served as a proxy for apatite dissolution. Plants were harvested biweekly during the 8 week experiment to measure changing Ca and P content in plant tissue with time. *P. vulgaris* grown in elevated CO_2 had a greater root to shoot ratio than plants grown under atmospheric CO_2. Microcosms containing plants had a lower pH than abiotic controls due to root respiration, nutrient uptake, and exudation of organic acids. Because of this, as much as 811% more Ca was released from biotic than abiotic experiments by the end of eight weeks. On average, the presence of plants resulted in the release of over 100 times more P than in abiotic experiments. Plants grown in elevated CO_2 released 82% more Ca and 80% more P than those grown in ambient conditions. Although elevated CO_2 helped plants to grow larger root structures and lower the solution pH, no significant change to weathering rates was observed during the experiment. These results suggest the importance of below ground carbon fluxes in creating changes to the rhizosphere which aid in P release from apatite.