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Can combinations of enhanced weathering and biochar co-benefit crop productivity and soil CO_2 sequestration?

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IPCC scenarios that limit global temperature rise well below 2°C involve large scale employment of Carbon Dioxide Removal (CDR) technologies on top of emission reductions. However, the efficiency and feasibility of CDR technologies is still uncertain. Two examples of CDR technologies that can be widely applied on agricultural lands are Enhanced Weathering (EW) and biochar. EW involves the crushing and spreading of silicate rocks, such as olivine-rich dunite, with the aim to enhance carbon dioxide (CO_2) consumption. The resulting increase in soil pH and release of nutrients may co-benefit crop productivity. However, dunite weathering also releases heavy metals, especially nickel, that may be taken up by crops. Biochar, produced through pyrolyzing organic materials, is a soil amendment with a high carbon content and reactive surface area. Biochar amendment has the potential to stimulate crop productivity and immobilise heavy metals. Previous experimental studies focused on single amendments of either EW or biochar, yet data on the potential co-benefits following their combined application is missing. We conducted a two-month greenhouse pot experiment growing maize (*Zea mays* L.) on soils mixed with dunite (doses ranging from 20 to 220 t ha^{-1}) with and without biochar (20 t ha^{-1}). On a weekly basis, soil CO_2 emissions were measured, and soil pore water was extracted for measurements of pH and total alkalinity. Upon termination of the experiment, nutrient and heavy metal concentrations were quantified in biomass using microwave digestion (HNO_3-HCl-H_2O_2) and in different soil pools applying appropriate extraction methods. The resulting samples were analysed by ICP-OES and ICP-MS. Soil and plant carbon contents were determined with a LECO CN analyser. These data were combined to identify potential heavy metal immobilisation and quantify CO_2 sequestration by calculating mass balances and carbon budgets. **The results that will be presented at the conference provide novel insights into the possible co-benefits resulting from EW and biochar combinations, with important implications for their CDR potential as described in IPCC scenarios.**