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The evolution of future geogenic matter fluxes due Enhanced Weathering: Results from the Antwerp Experiment

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Understanding the evolution of geogenic matter fluxes in soils due the application of rock products ontop of soils is relevant to evaluate alteration of soil solutions and saturation states of solutes. In the future the practice of applying rock products will continue and areas affected will likely spread (Hartmann et al., 2013). This trend will likely be fuelled by attempts to optimize carbon dioxide removal by increasing biomass production, soil organic carbon stocks, increase crop production or afforestation. All those efforts demand a certain amount of geogenic nutrients, which need to be replaced.

To investigate the release patterns and the downward transport of an array of elements, and to study their fate as well as reaction processes, altered through this practice, a mesocosm experiment was established at Antwerp University. Extended results will be presented (c.f., Weiss et al., 2014) focusing on the release and transport of DIC (dissolved inorganic carbon) and Mg (magnesium) in the soil column downwards after the application of 22 kg m^{-2} olivine powder. Elevated DIC and Mg concentrations are detected in case of olivine is applied to mesocosms with wheat and barley, if compared to the mesocsoms without plants, and without olivine. The change patterns in concentrations and fluxes will be discussed.

Hartmann, J., et al. (2013) Enhanced chemical weathering as a geoengineering strategy to reduce atmospheric carbon dioxide, supply nutrients, and mitigate ocean acidification. Reviews of Geophysics; 51(2), 113-149. doi: 10.1002/rog.20004

Weiss, A., et al. (2014) The overlooked compartment of the critical-zone-complex, considering the evolution of future geogenic matter fluxes: Agricultural topsoils. Procedia Earth and Planetary Science, 10, 339–342. doi:10.1016/j.proeps.2014.08.032