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# Silica fractionation and reactivity in soils

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The Si cycle is a globally important biogeochemical cycle, with strong connections to other biogeochemical cycles, including C. Silica is taken up by plants to form protective structures called phytoliths, which become a part of the soil and contribute strongly to soil Si cycling upon litter burial. Different silica fractions are found in soils, with phytoliths among the most easily soluble, especially compared to silicate minerals. A whole set of secondary non-biogenic fractions exist, that also have a high reactivity (adsorbed Si, reactive secondary minerals...). A good characterization of the different fractions of reactive silica is crucial to move forward knowledge on ecosystem Si cycling, which has been recognized in the last decade as crucial for terrestrial Si fluxes.

A new method to analyze the different fractions of silica in soils has been described by Koning et al. (2002) and adapted by our research team (Barão et al. 2013). Using a continuous extraction of Si and aluminum in 0.5M NaOH, biogenic and non-biogenic reactive fractions are separated based on their Si/Al ratios and their reactivity in NaOH.

Applying this new method I will investigate three emerging ideas on how humans can affect directly terrestrial Si fluxes.

-Land use. I expect strong silica fractionation and reactivity differences in different land uses. These effects due to agricultural and forestry management have already been shown earlier in temperate soils (Vandevenne et al. 2012). Now we will test this hypothesis in recently deforested soils, in the south of Brazil. 'Pristine' forest, managed forest and tobacco field soils (with and without rotation crops) will be studied. This research belongs to an interdisciplinary project on soils and global change.

-Fire. According to the IPCC report, extreme events such as fires (number and intensity) would increase due to climate change. We analyzed litter from spruce forest, beech forest and peat soils at two burning levels, after 350°C and 550°C burnings. The first results showed differences in silica fractions between treatments and between soil types. This project is a close collaboration with University of Dresden.

-Fertilization. Humans use fertilizers to increase crops growth and to avoid plagues affecting soil biogeochemistry. We set up a greenhouse experiment where olivine (a relatively easily weatherable silicate mineral) fertilization is applied to two crops (barley and wheat), at two rain application regimes (daily rain and weekly heavy rain) and with different fertilizer grain sizes. The aim of this project is to investigate how olivine application affects Si fractionation and reactivity in the soil profile.

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