Silicon fractionation in Mollic Fluvisols along the Central Elbe River, Germany

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Quantification of Si in its different forms in soil is a prerequisite to understand the geochemical distribution and fate of Si along with their driving biogeochemical processes. However, different Si fractions in floodplain soils have not been quantified yet, and little is known about the processes driving Si fractionation in these soils.

The aim of this study was to clarify the processes that drive formation and distribution of Si among fractions in floodplain soils. We obtained and quantified these fractions using a sequential Si extraction method [1] in three Mollic Fluvisols along the Central Elbe River.

The highest Si proportion apart from the residual fraction was found in minerogenic amorphous silica (up to 5.6% of total Si), followed by Si occluded in pedogenic oxides and hydroxides (up to 0.7% of total Si). Silicon from biogenic amorphous silica amounted to 0.02-0.6% of total Si. The smallest proportion of Si was found in the mobile Si fraction and made up about 0.01% of the total Si.

The results of this study demonstrate the importance of the soil water budget on the accumulation of easy-to-mobilise Si, Si occluded in pedogenic oxides and hydroxides and amorphous silica. Reductive dissolution of Fe and Mn oxides may induce Si release into the soil solution, subsequent oxidizing conditions may induce Si accumulation by adsorption, co-precipitation and occlusion of Si on/with newly formed Fe and Mn oxides. Accumulation of bio-opal after flooding may induce larger amounts of biogenic amorphous silica in floodplain soils than in terrestrial soils. Finally, floodplain soils may accumulate larger amounts of Si bound to occluded particulate SOM than terrestrial soils, which experience less input of particulate SOM than floodplain soils.

[1] Georgiadis *et al.* (2013) *Geoderma* **209-210**, 251-256.