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# Reactive Clay Minerals in a land use sequence of disturbed soils of the Belgian Loam Belt

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Clay minerals play a key role in soil biogeochemistry. They can stabilize organic matter, improve water storage, increase cation exchange capacity of the soil (CEC) and lower nutrient leaching.
Phytoliths – the biogenic silica bodies (BSi) deposited in cell walls of plants – are important Si pools in soil horizons due to their higher solubility compared to minerals. They provide the source of Si for plant uptake in short time scales, as litter dissolves within soils. In a recent study, we analyzed the BSi pool differences across a set of different land uses (forests, pastures, croplands) in 6 long-term disturbed (multiple centuries) soil sites in the Belgium Loam Belt. Results from a simultaneous chemical extraction in 0.5M NaOH of Si and Al, showed that soils were depleted in the BSi pool while showing high levels of reactive secondary clay minerals, mainly in the deeper horizons and especially in the forests and the croplands. During the extraction, clays were similar in reactivity to the biogenic pool of phytoliths. In order to study the kinetics in a more natural environment, batch dissolution experiments were conducted. Samples from different soil depths for each land use site (0.5 g) were mixed with 0.5 L of demineralised water modified to pH 4, 7 and 10. Subsamples of 2 ml were taken during 3 months.
In the end of the period, results for pH 7 showed that in the pastures, where reactive clays were almost absent, the ratio Si/RSi (defined as the Si concentration in the end of the batch experiment divided by the reactive silica extracted from the soil with the alkaline extraction) was lower than 0.005%. The same ratio was higher in the mineral horizons of forests (Si/RSi>0.01%) and croplands (0.005% < Si/RSi <0.01%) where clay minerals were the dominant fraction. These preliminary results highlight the clay minerals' strong potential for Si mobilization. More attention should be paid to this important fraction as it can contribute strongly to Si availability, in close competition with phytoliths and other soluble amorphous Si forms, strongly interfering with frequently applied methods to quantify biogenic Si in soils.