Universität Basel

Research Project

Soil degradation and nutrient export in the upper alpine level of the Reuss watershed

Third-party funded project

Project title Soil degradation and nutrient export in the upper alpine level of the Reuss watershed
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Soil degradation of upland soils, especially export of nutrients, influences nutrient content and biogeochemistry of riparian zones and wetlands in catchments significantly. Our hypothesis was that due to the fact that oxic upland soils with a predominantly assimilatory metabolism differ significantly from anoxic wetland soils and riparian zones with dissimilatory metabolism, stable isotopes of sulphur, nitrogen, oxygen and carbon can be used as potential tracers for the erosion of soil material from upland to lowland sites. Gradients from uplands to wetlands were recorded, both for sites influenced by erosion and non-degraded sites. The bulk d18O signal of a soil represents a mixing signature of all components of the soil. Differences between upland and wetland soils are expected to be due to changing mixing ratio and due to fractionation processes in the soil. As stable oxygen isotopes have not often been used in soil sciences so far, a new method had to be developed.
Both, carbon and nitrogen isotope signatures are different for upland and wetland sites. For wetlands more negative d13C and d15N values are recorded than for uplands which is principally caused by less decomposed organic matter in the wetland. An influence of soil degradation from the upland site (erosion source) in the wetland (sink area) is detectable in both the d15N and the d13C signal of the wetland. Stable isotope signatures of the top horizons in the wetland are shifted towards heavier values in comparison to an undisturbed site, representing a mixed signal of upland and wetland soil isotopic signature. However, sites which are treated with farmyard manure show heavier d15N values than untreated reference sites. Therefore it is assumed that a possible contribution of erosion to the d15N is masked by the application of manure.

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