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Modelling the impact of soil erosion on element transfer processes in agro-ecosystems

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Soil erosion is the main cause for loss of soil fertility worldwide. It can lead to degradation of soil structure, pollution of water bodies, decrease in crop productivity, and excessive accumulation of nutrients and trace elements in locations where eroded sediments are re-deposited. Research into the element transfer in fields and landscapes associated with erosion has hitherto focused on the assessment of element mobilization and nutrient export into aquatic ecosystems. Less is known about the role of erosion in element redistribution within terrestrial environments.

Hence, we are developing a GIS-linked model that describes and visualizes areal patterns of particle-bound element transfer processes at the field to catchment scale, adapting and combining existing process-based mechanistic models of soil erosion, soil hydrology, sediment transport, crop growth, soil nutrient turnover and soil pollutant dynamics. The model will be tested in a case study of selected catchment in the framework of the Swiss National Research Program “Sustainable Use of Soil as a Resource” (NRP 68).

The goal is to create a tool that can be used to aid monitoring nutrient and pollutant fluxes associated with erosion in agricultural landscapes, in particular to identify hot spots of excessive pollutant accumulation related to the deposition of eroded sediments on agricultural land for different scenarios of land use and climate change, and to support the evaluation of land management strategies aiming to control them.