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Soil erosion measurement and prediction in an Swiss Alpine Valley

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Mountains all over the world are unique in their economy, culture and ecology. The extreme topography, climate and remoteness of the areas are the origin of the beauty whilst simultaneously causing high instability, fragility and sensitivity of ecosystems in general and soils in particular. Our research group analyzes soil degradation in an Alpine Valley on various spatial and temporal scales using different methods: (i) Field measurements of sediment rates, soil characteristics, and stable isotopes: (ii) computer based approaches like modeling, remote sensing and regionalisation with GIS.

Our study site is a catchment area in the Furkareuss valley (80 square km, 1400 - 2500 m asl), located in the central Swiss Alps. Soil slips and sheet erosion are detected and then mapped through image analysis of aerial photographs. The resulting erosion map is verified by ground measurements. Sediment rates are measured with sediment traps on sites which differ in the land-use management. We analyzed the changes of radiogenic and stable isotope ratios in erosion source and sink sites and compare results with non-degraded sites. On the basis of these informations we compile a new erosion model to predict soil erosion. The goal with the model development is to link the process knowledge of small scale erosion with knowledge gained on large scale. First results indicate that for our case study a very active soil degradation zone is correlated to specific geological and hydrological conditions. Additionally, this sensitive zone is significantly influenced by land-use management changes.