

Publication

Methods to describe and predict soil erosion in mountain regions

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Suitable methods to describe and predict soil degradation in mountain areas with low accessibility, steep topography and extreme climate are urgently needed for suitable planning processes in Alpine regions under global change regime. Aerial photograph mapping has been proven to be a valuable tool in surveying landslide development over time. However, landslides < 10 m² as well as sheet erosion have been difficult to detect. Thus, the beginning of potentially heavy soil degradation cannot be tracked with aerial photographs. As an early warning system for soil degradation, we analyzed gradients of stable isotopes of carbon and nitrogen from upland (erosion source) to wetland soils (erosion sink). Oxidic upland soils and anoxic wetlands differ in their isotopic signature, due to differing isotopic fingerprints of aerobic and anaerobic metabolism in soils. Gradients of delta N-15 and delta C-13 in soils reflected erosion of material. However, if soils were fertilized with manure, the delta N-15 profiles were obscured. To quantify soil erosion, we noted that existing soil erosion models are generally unsuitable for mountain regions. As a first step, we developed a new modelling concept with a special algorithm for spatial discretization with irregular grids. The latter ensures three-dimensional water flow routing that is controlled by topography and not by the underlying algorithm. Regarding quantification of soil erosion an improvement and validation of existing modelling approaches or development of new models is urgently needed. (C) 2008 Elsevier B.V. All rights reserved.

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