Combining soil erosion modelling with connectivity analyses to assess lateral fine sediment input into agricultural streams

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Soil erosion has a major impact on the delivery of ecosystems goods and services, causing severe on- and off-site effects. On-site impacts include loss of organic matter and reductions in soil depth, thus decreasing agricultural productivity. Off-site effects are caused by the water-mediated sediment export from the fields, resulting in environmental damages, such as eutrophication of water bodies, clogging and smothering of spawning habitats, sedimentation of reservoirs and the corresponding loss in water storage capacity. Effective sediment management on the catchment scale, including the identification of sediment source areas and the way they connect to the channel network, is therefore essential for environmental management.

However, the sediment source–mobilisation–delivery process is a complex continuum, being highly dynamic in space and time, further depending on various factors that determine lateral sediment connectivity in catchment systems (e.g. topography, weather events, spatial land use patterns and management practices). In the presented study we i) combine different approaches towards a more integrated way to assess connectivity, i.e. the Index of Connectivity (IC) with the process-based soil erosion prediction model (Geo-)WEPP, and to ii) test an adapted version of the GeoWEPP model (i.e. "GeoWEPP-C"), to locate hot-spots for soil erosion (on-site assessment) and lateral fine sediment entry points (connectivity) to the drainage network (off-site assessment). IC and GeoWEPP-C results will be evaluated with field-based connectivity data.

Our results show that dynamic catchment-scale soil erosion and prediction modelling approaches that additionally consider aspects of connectivity relationships (i.e. the newly developed GeoWEPP-C model) yield more plausible results than traditional static representations of connectivity (i.e. IC). Detailed results as well as an in-depth discussion on the use of GeoWEPP-C in catchment management will be presented at the EGU General Assembly 2019.