Variability of sediment source attribution with CSSI over temporal and spatial scales – from soil texture to land-use unit and from event to seasonality.

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Soil erosion and its accompanying on- and off-site effects represent a serious threat to the environment. Over the last years many studies have been successfully carried out using compound-specific stable carbon isotopes of fatty acids (FA) and n-alkanes to characterize source soils and attribute suspended sediments or sedimentary archives to the characterized sources. One worthy next aim would be the extrapolation to large catchments. Important for this is a deepened knowledge about the variability of the signals over different temporal and spatial scales, which has so far been largely neglected, with the exception of a handful of studies. With this knowledge it should be possible to understand processes better in the catchment and deliver improved interpretation and representation of empirical data, ultimately supporting suitable mitigation actions to minimize sediment transport to aquatic environments.

In our study we present compound-specific stable isotope data of long-chain FAs from two neighbouring yet distinct (in terms of soils and land use) catchments, Aller and Horner Water (17.6km² and 22km² respectively), Exmoor, South-west England. To capture the spatial heterogeneity, we analysed possible source soils from different land-uses, including moorland, heather, forest, permanent grassland, arable and ley grassland on different soil textures (clay, loam, and peat) for their FA stable isotope signature. A very interesting outcome is the apparent influence that soil texture has on the stable isotope signal of the FAs of the same land-use units. To consider temporal variability, we present isotope data for FAs of high flow events from the main outlet and 4 sub-catchments of Aller and Horner waters over the course of one year. Three of these events have been sampled at a high temporal resolution of up to 24 sediment samples per event.

Previous research by our group found a significant importance of the seasonal variability in the suspended sediment origin in the Baldegg Lake catchment, Switzerland. In addition to such seasonal understanding, this study will allow us to understand the short-term variability in the origin of the transported sediments during storm events and to link it with high spatial resolution of the characterized source soils.