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Sediment source detection by stable isotope analysis, carbon and nitrogen content and CSSI in a small river of the Swiss Plateau

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Suspended sediment (SS) and organic matter in rivers can harm the fauna by affecting health and fitness of free swimming fish and by causing siltation of the riverbed. The temporal and spatial dynamics of sediment, carbon (C) and nitrogen (N) during the brown trout spawning season in a small river of the Swiss Plateau were assessed and C isotopes as well as the C/N atomic ratio were used to distinguish autochthonous and allochthonous sources of organic matter in SS loads. The visual basic program IsoSource with ^{13}Ctot and ^{15}N as input isotopes was used to quantify the temporal and spatial sources of SS. We determined compound specific stable carbon isotopes (CSSI) in fatty acids of possible sediment source areas to the stream in addition and compared them to SS from selected high flow and low flow events.

Organic matter concentrations in the infiltrated and suspended sediment were highest during low flow periods with small sediment loads and lowest during high flow periods with high sediment loads. Peak values in nitrate and dissolved organic C were measured during high flow and high rainfall, probably due to leaching from pasture and arable land. The organic matter was of allochthonous sources as indicated by the C/N atomic ratio and δ^{13}Corg.

Organic matter in SS increased from up- to downstream due to an increase in sediment delivery from pasture and arable land downstream of the river. While the major sources of SS are pasture and arable land during base flow conditions, SS from forest soils increased during heavy rain events and warmer winter periods most likely due to snow melt which triggered erosion.

Preliminary results of CSSI analysis of sediment source areas and comparison to SS of selected events indicate that differences in d^{13}C values of individual fatty acids are too small to differentiate unambiguously between sediment sources.