CHARACTERIZATION OF SEDIMENT SOURCES USING CSIA, HIGHLY SPECIFIC BIOMARKERS AND CONNECTIVITY MODELLING IN A SWISS CATCHMENT

M. Lavrieux[1], K. Meusburger[1], A. Birkholz[1], C. Alewell[1]

[1]Environmental Geosciences, University of Basel, Switzerland

The Baldegg Lake catchment (Switzerland) still suffers from a substantial eutrophication despite several restoration attempts during the last 40 years. The quite small lake (surface area: 5.2 km^2) is fed by 14 rivers and streams which cross various land-use and topographic contexts. Arable lands (cereals, vegetables, temporary grasslands, orchards) mainly develop on the Eastern and Southern parts of the catchment, while mixed forests and permanent grasslands are more common on the steeper Western part. We applied a mixed compound specific stable isotope (CSIA) / highly specific biomarkers approach to the catchment with the aim to track sediment source soils and source regions under different land use (grasslands, orchards, arable land or forest).

Soils, suspended river sediments and a lake sediment core were investigated to assess the molecular and isotopic signature of the potential sources (soils), as well as the short-term (river sediments) and long-term (lake sediments) variations of sediment origin. The soil sampling strategy was defined from (1) land-use data and (2) a sediment connectivity map of the catchment (built from topography and rugosity; 5-meters resolution). For the soils, five plots were sampled for each main land-use (arable lands, permanent grasslands, mixed forests, orchards). Each chosen plot was sampled in 3 different sites, and four replicates were taken at each site and subsequently mixed. Suspended river sediments were sampled from the 5 main rivers feeding the lake after each high-flow event, covering the last 2 hydrological years. A lake sediment core covering the last 130 yrs was sub-sampled at a 3-yrs resolution. Replicates were taken on a neighbouring and well-correlated core.

The isotopic and highly specific biomarkers signature of soils clearly discriminates between different land-uses. Regarding suspended river sediments, first results reveal discrepancies between the investigated rivers, as well as seasonal variations in the suspended sediments. The long-term evolution of the sediment origin observed in the lake core is explained when confronted to (1) land-use history and (2) sedimentological data. The dynamic of sediment origin over space and time revealed through this integrated (source-to-sink) study could serve as a basis for future management options to reduce sediment inputs to the Baldegg Lake.