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# Aquatic microorganisms or reed grass as potential disturbing factors in varved sediment records when tracing terrestrial input. An example from a eutrophic Swiss lake.

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Lake sediments can be used as great environmental archives, especially when they are varved due to anoxic conditions at the lake bottom. Such an annual resolution of these archives can give unique insights in past environmental and climate settings and changes. Here, we try to track back changes in the erosion dynamics and associated land-use and potentially climate changes at the catchment scale from seasonal to centennial scales at Lake Baldegg, Switzerland.

Land-use changes and agricultural practices become nowadays a key factor of sediment dynamics by modifying the soils erosive risk and the catchment sediment connectivity. And while soil erosion is one of the biggest threats to soil fertility as well as to ecological health of freshwater systems, restoration and management plans of water bodies can only be efficient if the sediment sources and their respective contributions, i.e. the proportion attributable to different land uses and agricultural practices, are identified.

For this we used a compound-specific stable isotope approach ($\delta^{13}C$ of long-chain fatty acids (LC-FA)) combined with connectivity modelling to a 130-years old varved lake sediment core from a eutrophic Swiss lake. We were able to discriminate grassland, arable and forest soils using the LC-FAs C26:0 and C28:0. Between 1940 to 1960 forest soils were the main source of the terrestrial sediment origin (80-100%). After 1960 a clear change in sediment origin happened. The contribution of arable and grassland soils to lake sediments were increasing. However quantitative attribution and differentiation between grassland and arable land were difficult due to the linear distribution of the tracers between the sources.

For sediments older than 1940 the isotopic signal could no longer be explained by today's terrestrial sources. We hypothesized additional sources of the assumed terrestrial long-chain fatty acids like (1) historical peatlands and/or former reed grass areas and (2) in-situ LC-FA production by algae.

Since the last presentation at EGU2019 we went back to Lake Baldegg to expand our potential source sample set to explain deviation of source signals from sediments. After consultation of historic maps and reports, we located sites where peatlands and reed grass existed before the 1940s and where reed gras is still growing. There we took plant as well as soil samples and

peat/lake sediment cores from a historical pond, which was connected to the lake and where reed grass grows today.

To investigate the potential in-situ production of LC-FAs by algae or other microorganisms in the water column, we did four sampling-trips on the lake between April 2021 and September 2021 to get algae and water samples from different depths and integrating over depth. These samples were filtered over glas fibre filters, extracted and analysed for FAs. In some samples we found LC-FAs in different concentrations. Especially for the algae samples this was surprising. Depending on their isotopic signature we can now differentiate between terrestrial or aquatic production.

The proof of significant aquatic contribution of LC-FAs to lacustrine sediments in Swiss lakes would be an important finding also regarding the common use of assumed terrestrial biomarkers in lake sediments for climate reconstruction.