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Identification of trends and patterns in sediment geochemistry from the Aare delta plain, Swiss Alps.

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The study of fluvial systems by means of sediment cores is one of the most interesting approaches to understand the spatial and temporal pattern of river dynamics under the influence of different driving forces such as climate variability and human activities.
This work focuses on the analysis of the geochemistry of fluvial sediments from the Aare delta plain in the Swiss Alps.The analysis of sediment cores allowed the identification of trends and patterns in sediment geochemistry. It was possible to identify diverse sedimentation phases in the delta plain, marked by differences in sedimentation processes and characterized by decreasing grain size sequences. It is worth mentioning the importance of peat formations in this sedimentary environment, reaching several centimeters thick in some cases. These horizons are normally associated with very low concentrations of chemical elements from the mineral fraction, such as Si, Al, Fe, and K.
The general trends in geochemistry indicate the dominance of elements such as Al and Si, which have similar variability in all cores. It is noted that these elements have a reasonably good correlation with grain size and inverse relation with organic matter content.
Factor analysis was used to study the geochemical data set of 3 sediment cores. This analysis is based on a statistical description of the variability of the correlated data where a smaller number of not observed variables are obtained (factors). Factor analysis attempts to find joint variation of the data series and presents that response as unobservable latent variables. In this study, factor analysis was conducted with the major chemical elements: Al, Si, P, K, Ca, Ti, Mn, Fe, Cu, Zn, Pb and also the percentage of TOC. Variations of these 12 inorganic and organic elements are reflected in two unobserved variables, factor 1 and factor 2.
Factor analysis has enabled the recognition of two clusters: 1) a group of elements that include the TOC and metals, which are associated with organic horizons and 2) a group of inorganic elements, where the main response seems to be associated with phyllosilicate and siliciclastic minerals.
A paleoclimatic analysis was also carried out using the main observed trends of the geochemistry analysis. This helped to identify a possible link between phases of increased fluvial activity and cold climatic periods. These phases are supported by an accumulation of coarser materials (sand-dominated layers) and may be influenced by glacier dynamics. It is assumed that during cold climatic periods, glaciers have greater erosive capacity. In warm periods there is strong evidence of an increase of peat formation.