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Climatically controlled sediment deposition patterns in a high alpine lake (Lake Anterne, French Alps)

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Lake Anterne is a small (ca. 0.11 km^2, 13.2 m max. water depth) high-alpine lake located at 2061 m asl in the French Alps. Through its location mainly influenced by low-pressure systems bringing moisture from the North Atlantic this site represents a highly sensitive location to identify climate changes at high alpine regions of the NW Alps. Ongoing research of the geomorphological processes in the catchment suggests that the sediment supply into the lake is mainly controlled by snowmelt in late spring and early summer, while in winter the lake is frozen and only fine-grained particles settle down. The laminated silts and clays observed in sediment cores of the deepest part of Lake Anterne reflect this annual pattern and possibly represent clastic varves thus allowing a precise dating of the sediment record. This assumption is supported through previously made comparisons between the 210-Pb and 137-Cs dating results and laminae counting made directly on a sediment core. However, subannual rhythmites which are attributed to summer rainfall events with increased fluvial sediment delivery appear to be intercalated within the varves. A higher accuracy of laminae counts as well as a better understanding of sedimentation processes is archived through the study of large format thin sections as well as high resolution grain size analysis and XRF scanning. These analyses show different facies types which can be related to annual sedimentation patterns, turbidite deposits related to rainstorm events and layers deposited through failures of the delta fronts triggered by earthquakes. Lake monitoring using temperature data loggers and sediment traps will give further insights into the external (climatic) factors controlling sediment deposition and will allow the identification climatic changes in the laminated sediment record.