Late Glacial to Holocene climate variability and anthropogenic impact as reflected in a high resolution sedimentary record from Baldegger See, Central Switzerland

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Multiproxy data from the sedimentary record of Baldegger See on the Swiss Plateau reflect remarkable climate variations during the last 16000 years as well as strong anthropogenic changes starting within the Roman period at 2000 cal y BP.

Several sediment cores, up to 8m long were retrieved from eutrophic Baldegger See in the deepest part of the basin in >60m water depth. The regularly deposited sediment consists of faintly to well-laminated carbonate-rich mud formed by biochemical processes within the lake. Remarkable are up to 70cm thick intervals of finely laminated biochemical varves, representing dark organic-rich autumn/winter laminae and light calcite-rich spring/summer laminae. Up to a few cm thick turbidites occur throughout the sedimentary record and mark major flood events. The recovered sedimentary record was dated by varve counting in certain intervals, radiocarbon dating of plant debris, and tephra chronology (Laacher See Tephra (LST) and Vasset Killian Tephra (VKT)) and dates back to approximately 16000 cal y BP. Measured multiproxy data includes median grain sizes, nutrients (C_{org}, C_{inorg}, N_{tot}), and metals (Ca, Ti, Mg, Fe, Mn).

The sedimentary record shows two intervals of enhanced turbidite frequency accompanied by overall high median grainsizes and low Ca/Ti ratios: between 11400 cal y BP to 8300 cal y BP and from 2000 cal y BP to today. The older interval of enhanced allochthonous influence can be related to the high discharge rates from the melting Alpine glaciers at the beginning of the Holocene. The coarser grain sizes of the more recent interval can be attributed to high erosion rates, caused by increased settlements and deforestation along the lakesides, starting during the Roman period.

Eight major intervals with varve formation can be distinguished during the last 7000 years: 6800-6700, 5400-4700, 4200-3400, 3100-2600, 2200-2100, 1600-1300, 450-400 cal y BP and the last 120 years. Within these intervals C_{org} and N_{tot} concentrations are high and mark an increased productivity within the lake. High Mn and Fe concentrations indicate anoxic bottom water. Therefore, varved intervals are related to warmer climate conditions causing an increase of lake productivity and reduced deep water mixing. The youngest varves clearly reflect the increasing anthropogenic eutrophication of the lake during the last 120 years as indicated by highest N_{tot} values and highest median grainsizes due to crystal growth of authigenic calcite.

The obtained environmental data can be correlated to global and regional climate reconstructions, thus, allowing a better understanding of climatic and anthropogenic influences during the last 16000 years.