Zn isotopes can reveal past eutrophication of continental lakes : The example of Baldeg (Switzerland)

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In this study, the isotopic signature and crystal-chemical of Zn were followed across a sediment core from an alpine lake (Lake Baldeg, Luzern, Switzerland) that experienced a marked eutrophication period from 1885 to 1985 [2]. These environmental conditions lead to the accumulation of varved sediments [3], which enabled us to explore the potential of Zn speciation and isotopic signature to record past environmental conditions in continental lake systems. The results obtained indicate that both Zn speciation and isotopes in the sediments recorded the differences between mesotrophic and eutrophic conditions in the water column. During the mesotrophic period, sedimentation was mainly detrital and Zn is mainly associated with clay minerals, whereas during the eutrophic period sedimentation was dominated by biological activity in the water column and Zn mainly occurs as ZnS. Zinc isotopes recorded these changes in the sedimentation regime, with a mean $\delta^{66}Zn_{JMC}$ value of +0.27±0.02‰ (*i.e.* similar to the Bulk Silicate Earth value of +0.28±0.05‰ [4]) for the allochthonous sediments and a mean $\delta^{66}Zn_{JMC}$ value of +0.10±0.04‰ for the autochthonous sediments. Comparison with another study at nearby Lake Graffen [5] suggests that the enrichment in light Zn isotopes in the autochthonous sediments is due to Zn uptake by diatoms, which has been shown to favor light isotopes in the biomass [6,7]. Since lake eutrophication is mainly related to hydrological conditions and occupancy of the related catchment, these results emphasize the potential of such a combination of molecular level speciation and Zn isotopes in sediments to track paleo-environmental conditions in continental lake-catchment systems.

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