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Zinc stable isotopes as tracers for Zn pollution in sediment cores from historically polluted Lake Biwa and Osaka Bay

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Zinc stable isotopes of dated sediment cores have become popular tracers for Zn contamination throughout the Anthropocene time. Here, we present Zn stable isotope (δ^{66}Zn) data and trace metal concentrations obtained by the Community Bureau of Reference (BCR) sequential extraction procedure for dated marine and lake sediment cores from Japan. We found the anthropogenic Zn was primarily hosted in the acid-labile and reducible fractions indicating that Fe-Mn oxyhydroxides formed in the water column scavenged Zn and that calcifying organisms such as foraminifers incorporated Zn into their shells. A slight decrease in the δ^{66}Zn values accompanied by increasing Zn concentrations is observed during the second half of the 20th century. The δ^{66}Zn values fell in a binary mixing process between a lithogenic (~ +0.28‰) and an urban, industrial endmember (~ +0.15‰). Nevertheless, the δ^{66}Zn of bulk sediments represents a complex mixture of Zn adsorbed on environmental surfaces, e.g., oxyhydroxides and carbonates, Zn as part of organic matter or Zn in lattice structures of minerals. Such adsorption processes lead to Zn isotopic fractionation. We plan to determine δ^{66}Zn values in the chemical fractions to understand their variability in δ^{66}Zn and to identify the most suitable fraction as an anthropogenic tracer.