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# The history of anthropogenic induced Zinc input to the German Bight, North Sea

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In sediments of the Helgoland mud area, one of the few depocenters in the shallow North Sea, increased zinc concentrations, compared to the natural background, have been found. These indicate human-induced pollution of this near-coastal area with yet uncertain consequences for the ecosystem. Initially, the high Zn input has been related to the dumping of polluted harbor muds in the time after World War II. However, more recent data point to a much earlier onset of high Zn input beginning already at approximately 1750 A.D., possibly related to the very early onset of industrialization and its effects on silver and zinc mining in the Harz Mountains. The Harz Mountains as well as the Erzgebirge are well-known mining areas, exploited for several centuries, and both lie along the tributaries of the Elbe and Weser rivers, both draining into the German Bight. Even before, during medieval times, mining activities in the Harz Mountains have been identified as the most likely reason for elevated Zn contents in river clays of the Weser River. A further increase in Zn content in these sediments occurred at approximately 1900 A.D. and probably reflects increasing environmental pollution in the course of an accelerating industrialization. Exploiting a set of sediment cores collected from various sites on the Helgoland mud area, this study aims to assess the Zn distribution in these sediments, to verify the temporal development of Zn input and, finally, to quantify the anthropogenic Zn input into the German Bight. Using XRF-scanner and quantitative XRF analysis, the absolute concentrations of Zn and other heavy metals in the sediment cores were determined. The results reveal some scatter for the initial steep increase in Zn concentrations in the sediments occurring in core depths between 20 to 100 cm. Ongoing radiocarbon dating analyses will reveal if these onsets are contemporaneous. Combining these data will allow for the intended quantification of anthropogenic Zn input.

To reconstruct past environmental changes by using sedimentary archives, it is essential to know the exact age of specific sediment layers. Dating of the sediments is therefore a crucial parameter in any palaeo-reconstruction. The method of choice – radiocarbon dating – is based on the ratios of carbon isotopes in organic material within the sedimentary layer and is prone to various uncertainties. These are for example based on changes of the atmospheric composition of carbon isotopes, reservoir effects, and input of younger or older organic material. To minimize these effects, several records from similar locations should be correlated and other dating methods may be applied to verify radiocarbon ages.