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Spatially distributed analysis of heavy metal pollution in the upper catchment of the river Oker, Germany

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Heavy metals are still found in the rivers of the Harz Mountains in Germany as a result of mining. In the EXDIMUM research project (Extreme Weather Management with Digital Multiscale Methods) a spatially distributed measurement campaign was carried out in the catchment of the river Oker upstream of the gauge at Schladen. The focus was on the rivers Gose and Abzucht upstream of the city of Goslar. The objectives of this research were to quantify the deposition of heavy metals in the sediment and to identify source areas of heavy metal pollution in the catchment. To this end, sediment samples were taken from the river bed of the main and tributary rivers upstream of each confluence, so that it was possible to determine from which sub-catchments heavy metals entered the main channel. The sediment samples were analyzed for various heavy metals in the environmental laboratory of the Christian-Albrechts-Universität zu Kiel using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Total content of lead and zinc were above reference values like the threshold effect concentrations (TEC) and the probable effect concentrations (PEC) and the effects range-low (ERL) and the effects range-median (ERM) in several sediments. The spatial analysis shows that elevated levels of contamination occur particularly in the vicinity of former mine pits, smelter sites, and mine dumps. Within the EXDIMUM project, further campaign measurements during and after a flood event are planned, which, together with the modeling of runoff and sediment discharge in the study area, should allow to draw conclusions on the potential influence of extreme events on the export of heavy metals.