Geophysical Research Abstracts
Vol. 21, EGU2019-5893, 2019
EGU General Assembly 2019

Segregation of pollutants in artificial lake: case study in Nechranice Dam Reservoir, the Ohre River, Czech Republic

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The Ohre River received pollution from mining and processing of Ag, Cu, Pb, Sn, and U ores in a few past centuries. Major part of the resulting As, Cu, Pb, Sn, and Zn pollution has originated from the mining peak in the 16th century, while the primary U pollution spike occurred due to the failure of a settling pond in the early 1960s. Part of the primary pollution from those historical periods has been temporarily stored in channel bars of the middle reach of the Ohre River and now it undergoes persistent reworking and is transported downstream. Since the late 1960s, that transport has been influenced by the construction of Kadan and Nechranice dam reservoirs (KDR and NDR, respectively).

KDR sediments were obtained by grab samplers, while NDR sediments were acquired by UWITEC gravity corer and analysed by laboratory XRF. NDR sediment stratigraphy was based on identification of the boundary of pre-dam (fluvial) and dam reservoir sediments associated sometimes with changes in sediment lithology and Fe concentration and mostly with U-pollution spike and the change in the Sn concentration.

The KDR is too small (dam height 14 m, water residence time ca 1 day) to represent a relevant hindrance to the downstream transport of pollution carried by fine particles. The NDR (dam height 47 m, water residence time ca. 108 days) has trapped a considerable portion of Sn and U pollution and a part of Cu, Pb, and Zn. Pollutants are segregated in the NDR, probably depending on the pollutant particle density. The most characteristic feature of As in the NDR sediments is its post-depositional vertical migration and formation of secondary (diagenetic) concentration peaks related to the depth profile of total Mn in sediments.

The overall amount of the NDR sediments with >100 mg/kg Cu and Pb and >500 mg/kg Zn is ca. 10 Mt.