



## Impact of historic mining activities on fluvial sediment dynamics

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Holocene floodplain deposits are often used as environmental archives of terrestrial ecosystems, but often radiocarbon dating is problematic due to the absence of datable material. One of the possible alternatives is the use of floodplain contaminants, where the presence of contaminants in sediment indicates that these sediments were deposited after the initiation of contamination.

The Geul river catchment (350 km<sup>2</sup>) is located in the loess region of eastern Belgium and southern Netherlands. Lead was probably mined since Roman times, but main mining activities started in 1844, and all mines were closed by 1882. Large amounts of Pb (and other) contaminants were deposited in channel bed and the floodplain following these mining activities, and contaminated deposits are still being reworked by the river. As a result, all sediments which are deposited since 1844 are polluted with Pb. Previous studies on point bar deposits have shown that peaks in Pb production of the mining sites can be recognized in these deposits as peaks in Pb concentration.

Sediment samples for analysis were collected from 17 percussion drillings at three floodplain locations (with overbank deposits) and one point bar location, while 35 additional corings give information about the fluvial architecture. Lead concentrations of samples representing 0.05 to 0.2 m soil depth were determined using the flame atomic absorption spectroscopy method. Pb concentrations were plotted to depth, and peaks in Pb concentrations were linked with the mining history to allow the identification of sediments deposited during the start of the mining (1844-1847) and for some corings also during the peak in mining activities (1869).

The presence of Pb in gravelly point bar deposits indicates that since the initiation of mining (1844) the lateral movement was 5 to 7 m. On the other hand, previous research suggests that the entire floodplain (150 m wide) has been reworked by meandering during the Holocene. Results for the overbank deposits show that sediment deposition was highest between 1847-1869 (8 mm/a). After the peak mining period (1869-2007) deposition was much lower (1.7 mm/a), but nevertheless still much higher than before the main mining period (early Holocene – 1847: 0.25 mm/a). Although measurement periods differ largely, these differences in rates clearly illustrate the influence of human land use, both mining and agriculture, on fluvial sediment dynamics.