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Small-scaled spatial lead distribution in floodplain soils of the Vils River (Upper Palatinate, Germany) determined by field-portable X-ray fluorescence analysis (FPXRF)

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In the upper reaches of River Vils (Upper Palatinate, East Bavaria, Germany) the floodplain sediments are enriched with lead as a consequence of former lead mining and ore processing since the 15^{th} century. Own investigations on 150 percussion drilling cores between 2001 and 2005 have shown, that the alluvial soils are contaminated with lead contents of more than 20,000 mg kg^{-1}. Furthermore, an exponential increase of lead pollution was determined alongside a 12 km long fluvial section of the Vils River towards the former mining site. Anymore there is a change of high ($>$ 10.000 mg kg^{-1}) with comparatively low ($<$ 1.000 mg kg^{-1}) lead contents on a small scale ($<$ 50 m). New studies since 2005 try to map these small-scaled lead distribution and characterise horizontal and vertical contamination patterns in the scale of metres and centimetres. In a 9 ha test area at Freihung ten percussion drillings were sunk to 1 m depth alongside a 50 m transect perpendicular to the Vils River. The cores were sampled in intervals of 1 cm (1000 samples), dried at 40˚C, sieved to a fraction $<$ 2 mm and homogenised with mortar and pestle. The determination of total lead contents was carried out by field portable X-ray fluorescence analysis (NITON XL 722s).

More than half of the depth plots of the lead contents show sharply bounded narrow peaks to the extent of 25,000 mg kg^{-1}. The maximum peaks are restricted to the upper 30 cm of the profiles. Downwards, the lead concentrations rapidly decrease to amounts

of < 100 mg kg^{-1}. Regression analysis of total lead contents with measurements of carbon, nitrogen and sulphur (determined by ELEMENTAR vario EL III) results in poor correlations of C/Pb: r = 0.073; N/Pb: r = 0.107; S/Pb: r = 0.098. In regard of each horizon separately, there are quite good correlations e.g. for the humous topsoils with C/Pb: r = -0.775; N/Pb: r = -0.778; S/Pb: r = -0.749 or the oxidised gleyic horizons with C/Pb: r = 0.795; N/Pb: r = 0.716; S/Pb: r = 0.703.