

Barium concentrations and availability in floodplain soils



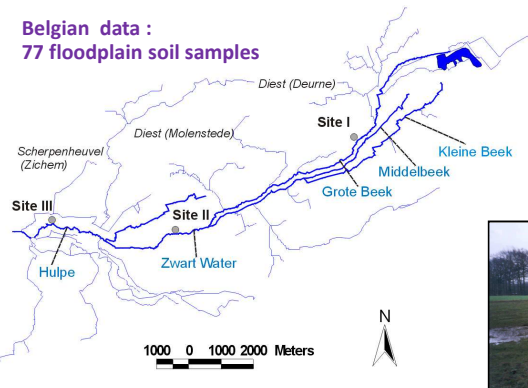
Objectives

- Ba concentrations in Belgian and European floodplain soils
- relationship between physico-chemical soil characteristics and total Ba concentrations
- assess Ba availability in sediments, based on single extractions



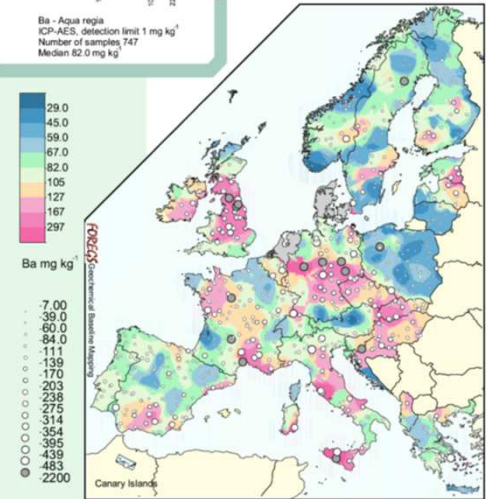
Materials and methods

Belgian data : 77 floodplain soil samples



- 77 samples analyzed for **major elements**, **trace elements** (multi-acid digestion), CEC, grain size, organic carbon content, pH
- **Single extractions** with CaCl_2 (0.01 mol/l and 0.1 mol/l), CH_3COOH (0.43 mol/l) and ammonium-EDTA (0.01 mol/l) on 65 samples

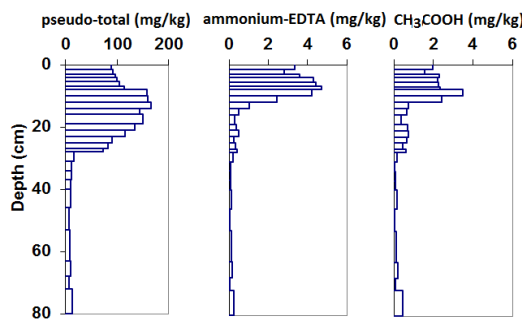
Europe: FOREGS data



- Data from 747 floodplain soils
- Total concentrations of major elements (XRF)
- Ba: ICP-MS after aqua regia (AR) and XRF

Results and discussion

Single extractions

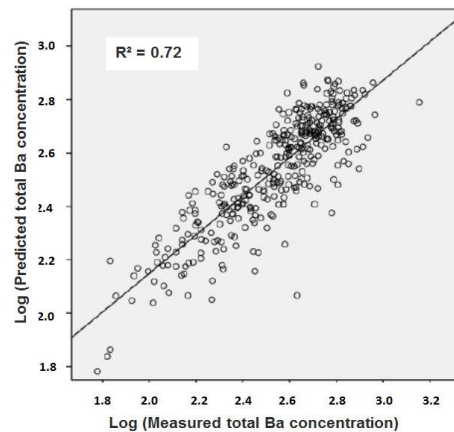


=> very small proportion of Ba is readily available for uptake by living organisms or for leaching.

=> elevated total Ba concentrations are not indicative of a higher risk of mobilization, even when other parameters such as matrix composition and pH are taken into account.

Total Ba concentrations

Stepwise linear regression with major elements (XRF determination) and TOC content as independent variables



=> regression equation with log transformed concentrations of Fe_2O_3 , CaO , K_2O , Na_2O , and P_2O_5 as independent variables allows to predict Ba concentrations in the floodplain soils.

$$\Rightarrow \text{Log} [\text{Ba}] = 6.04 + 0.16 \log [\text{Na}_2\text{O}] + 0.44 \log [\text{K}_2\text{O}] + 0.24 \log [\text{Fe}_2\text{O}_3] + 0.15 \log [\text{P}_2\text{O}_5] - 0.1 [\log \text{CaO}]$$

Conclusions

Single extractions

- to be considered when environmental quality guidelines are set up for Ba,
- useful for a fast screening of potential Ba contamination with an unacceptable risk for the environment.

Regression equations with major elements as independent variables allow to predict Ba concentrations in soils, and also enable to detect potential anomalies.