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NONPARAMETRIC UNCERTAINTY ANALYSIS IN FIELD SCALE APPLICATION OF EXTENDED SORPTION ISOTHERMS

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The risk of groundwater contamination by trace elements is usually assessed at field scale and quantified using spatially aggregated values. The fate of trace elements in the soil- groundwater pathway is predominantly governed by the sorption characteristics of the soil. Semi empirical pedotransfer functions (PTF) based on extended Freundlich equations can be applied to estimate the sorption behaviour from common soil properties such as pH, Corg and cation exchange capacity. Such PTF have been derived for Cd, Cr, Cu, Ni, Pb and Zn by multiple regression analysis on a national scale for soils used as arable or grass land PTFA (Utermann et al. 2005) and forest PTF (Heidkamp 2005). Altfelder et al. (2007) splitted the residual variance between modelled and measured trace element concentrations sorbed to the soil into on-site and between-site variance and calculated a ratio of approximately 70% to 30%, respectively. Possible sources of variance are the model error resulting from the ignorance of sorption relevant soil properties; the variability resulting from the heterogeneity of soil properties and uncertainty resulting from imperfect knowledge. In this study the PTFs performance will be evaluated under conditions with background level trace element concentrations on sites not used in the PTF training dataset. We focus on how the field scale uncertainty and variability in sorption relevant soil properties and trace element concentrations affect the PTF results in three case studies. Thereby we hypothesize given the PTF is valid spatial variability of soil properties to be the predominant source of variance.