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Influence of parameterization strategy for parent material effects in predictive mapping of topsoil geochemistry

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The distribution of trace elements in soils is complex and reflects the geochemistry of the original geological substrates modified by variety of environmental and human-induced changes of soil environment. An effective use of geological information within digital soil mapping and geochemical mapping over large require a degree of class aggregation into several broad nominal (or ordinal) classes. Nevertheless, there are several potential weaknesses of the reclassification of lithological information - lithological variation within geological units, variation in composition of individual lithological types, and inadequate description of lithology in geological map. Hence, we tested how the predictive geochemical mapping using environmental correlation will be sensitive under various complement scenarios using aggregated geological substrates and additional numeric covariates that partially represent parent material such as subsoil texture, land gravity data (gravity survey Bouguer anomaly) and other geophysical spatial data (airborne magnetic and gamma radiometric surveys). To compare various scenarios, we have used lithological classification in combinations with other numerical substrate-wise covariates in pragmatic predictive geochemical models using quantile regression forest over contrast area (approximately 11 000 km^2) in the Czech Republic. Thee independent geochemical datasets for soil trace elements after the acid digestion procedure were used to train and validate the predictive models. Lithology-wise covariates were iteratively combined with the joint set of other readily available covariates representing topography, land use, remotely sensed surface characterisation (using a cloudless bare soil composite assembled from Sentinel 2) and depositional inputs of trace elements into soil to compare the prediction of topsoil concentrations of trace elements under various research strategies for parametrisation of lithological information. The results enabled to select optimal covariates suite for lithology parametrisation for the complex nation-wide model for topsoil contents of trace elements.

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