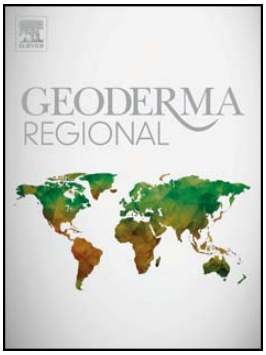

3D mapping of soil texture in Scotland.

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3D mapping of soil texture in Scotland.

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Abstract

Reliable spatially explicit information about soil is important for global environmental challenges. Soil texture is one of the soil most important characteristics as it drives several physical, chemical, biological, and hydrological properties and processes. Despite the importance, there is scarcity of information on soil texture, especially at the resolution required for environmental modelling. Many recent efforts modelled soil texture with different approaches focussing on the spatial relationships with environmental covariates. This study aimed at i) modelling and map soil particle classes for Scotland at medium resolution (250m), for topsoil and the whole profile, using an operational DSM approach following specifications from the GlobalSoilMap project; ii) assessing the spatial uncertainty of the modelling approach, and iii) evaluating the impact of spatial and modelling uncertainty on soil texture classification of the topsoil. An extension of the `scorpan`-kriging approach, i.e. hybrid geostatistical Generalized Additive Models (GAMs), combining GAM with Gaussian simulations was used on Additive-Log-Transformed soil particle classes. The R^2 calculated with the validation dataset was between 0.55 and 0.60 and the RMSE values were below 13%. The set of covariates used in this study explained about 40% of the variance of the data. The significant covariates included morphological features, vegetation index and information about the phenological season. The results also showed a large percentage of the variability to be spatially structured. The assessment of the uncertainty on the soil texture classification showed variability and class shift. The resulting datasets can be used as input for further modelling in a number of areas, and they are also important for soil functions modelling