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# Geostatistical analysis for Uncertainty Quantification in the SMART-SED model: a downscaling approach based on Digital Soil Mapping data

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SMART-SED is a project aimed at developing an innovative framework for the numerical simulation of sediment motion in river catchments, intended to be used by local territorial management institutions and professionals to design proper strategies for the mitigation of hydrogeological instability. Uncertainty analysis is an intrinsic feature of models simulating natural processes. In order to perform an effective uncertainty quantification, it is necessary to properly identify the variability of the input parameters and to design stochastic simulation methods able to provide realistic realisations, based on the available data. This thesis focuses on the use of digital soil maps for the prediction and stochastic simulation of terrain-related quantities used for the estimation of the input parameters of the SMART-SED model. The digital maps are obtained from SoilGrids, a system for automated soil mapping based on state-of-the-art spatial predictions methods. Innovative approaches are introduced to account for the limitations of SoilGrids data (low resolution, inaccuracy) and for the specificities of the variables in exam. Although the focus is on the SMART- SED project, the methods proposed can be generally used for geostatistical modelling at a local scale using auxiliary coarse information obtained through remote sensing or from previously fitted digital maps.