



Using scale dependent variation in soil properties to describe soil landscape relationships through DSM

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DSM formalizes the relationship between soil forming factors and the landscape in which they are formed and aims to capture and model the intrinsic spatial variability naturally observed in soils. Covariates, the landscape factors recognized as governing soil formation, vary at different scales and this spatial variation at some scales may be more strongly correlated with soil than at others. Soil forming factors have different domains with distinctive scales, for example geology operates at a coarser scale than land use. By understanding the quantitative relationships between soil and soil forming factors, and their scale dependency, we can start determining the importance of landscape level processes on the formation and observed variation in soils. Three study areas, covered by detailed reconnaissance soil survey, were identified in the Republic of Ireland. Their different pedological and geomorphological characteristics allowed to test scale dependent behaviors across the spectrum of conditions present in the Irish landscape. We considered here three approaches, i) an empirical diagnostic tool in which DSM was applied across a range of scales (20 to 260 m²), ii) the application of wavelets to decompose the DEMs into a series of independent components at varying scales and then used in DSM and finally, iii) a multiscale, window based geostatistical based approach. Applied as a diagnostic approach, we found that wavelets and window based, multiscale geostatistics were effective in identifying the main scales of interaction of the key soil landscape factors (e.g. terrain, geology, land use etc.) and in partitioning the landscape accordingly, we were able to accurately reproduce the observed spatial variation in soils.