# Spatial Aggregation and Soil Process Modelling

Gerard Heuvelink

Environmental Sciences, University of Amsterdam
Nieuwe Prinsengracht 130 NL-1018 VZ Amsterdam
e-mail: gh@fgb.frw.uva.nl

Nonlinear soil process models that are defined and calibrated at the point support cannot at the same time be valid at the block support. This means that in the usual situation where model input is available at point support and where model output is required at block support, spatial aggregation should take place after the model is run. Although block-kriging does both in one pass, it is sensible to separate spatial aggregation from spatial interpolation. Contrary to aggregation, interpolation should better take place before the model is run, because in that case more use can be made of the spatial correlation characteristics of individual inputs. When a model is run with interpolated inputs it is important not to ignore the interpolation error. Substituting conditional expectations instead of probability distributions into a nonlinear model leads to bias, essentially for the same reason that aggregating inputs prior to running a model yields a different result than aggregating the output after the model is run. Running a model with inputs that are probability distributions will usually call for a Monte Carlo simulation approach. This brings with it a substantial increase of numerical load, but apart from eliminating bias, an additional important advantage is that the uncertainty in the model output becomes known. Many models used in soil science suffer not only from input error but also from model error. Model error is both support-dependent and case-dependent. The latter implies that model error can only realistically be assessed through validation. Here we face again a change of support problem, because point validation measurements must be aggregated to the block support. Use of meta-models to aggregate validation data must be discouraged because hidden similarities in behaviour between the meta-model and the model to be validated will yield too optimistic validation results.