Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03392, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03392
EGU General Assembly 2008

Digital soil mapping, or digital soil information?

R.M. Lark (1), R. Corstanje (1), M.J. Pringle

(1) Rothamsted Research (2) Department of Natural Resources and Water, Queensland, Australia. (murray.lark@bbsrc.ac.uk)

The objective of digital soil mapping should not be to produce a static product, a soil map (by classes or of properties), even if that map is in digital format, but rather to generate a soil information system capable of providing information needed by particular users for particular problems. In this paper I want to illustrate three key ways in which the digital soil information system, as a dynamic entity, differs, or could differ, from a static map in digital format.

The first difference is in the representation of soil, land-use or other classes. Such information may often be useful for landscape-scale study of physical processes in the soil. Point observations of classes at calibration sites are typically used in DSM to produce a map of classes using methods for allocation, such as discriminant analysis or classification trees, and covariates such as remote sensor data. However, the resulting maps will be in error. A classical static map of classes is generally produced so as to maximize the overall map accuracy. However, particular users may be more concerned with the accuracy with which particular subsets of the classes are represented, and may weight particular errors of commission or of omission differently. A key advantage of the digital soil information system is that class predictions can be generated, from calibration data and covariates held in the system, which are most appropriate for particular users. This will be illustrated with examples where landcover is predicted from remote sensor data.

The second issue is the choice of pedotransfer functions (PTF) for predictions of particular, generally hard-to-measure, soil properties from other readily available soil information. As a general rule it is assumed that the best PTF to use is the one which minimizes the overall mean square error of prediction for the target property. This would be true if we want to make a static map of the property for general unknown future users. In practice, however, PTF output is required as input for process models. It is shown that the mean square error in the output of such process models due to propagated error from the PTF predictions is not necessarily smallest when the globally optimal PTF is selected. The covariance of the errors of all inputs must be considered. Again, the implication is that particular data users with particular requirements will not all be best served by the same static product, and that digital soil information systems must be capable of generating outputs that meet the needs of particular users.

Third, a static map product has a fixed spatial scale and information is generalized to some fixed pixel size. Different users will require information at different scales, and in many circumstances the choice of a predictive model for particular processes will be scale-dependent (since some models perform better at certain scales than others). This will be illustrated using examples from modelling gaseous emissions from soil. It will be shown how the most appropriate scale at which to represent the output of a particular model can be computed by means of a new statistic, the inter-block correlation.