Geophysical Research Abstracts
Vol. 17, EGU2015-1953, 2015
EGU General Assembly 2015

Map scale and the communication of uncertainty

Murray Lark
British Geological Survey, Nottingham, United Kingdom (mlark@nerc.ac.uk)

Conventionally the scale at which mapped information is presented in earth sciences reflects the uncertainty in this information. This partly reflects the cartographic sources of error in printed maps, but also conventions on the amount of underpinning observation on which the map is based. In soil surveys a convention is that the number of soil profile observations per unit area of printed map is fixed over a range of scales. For example, for surveys in the Netherlands, Steur (1961) suggested that there should be 5 field observations per cm^2 of map. Bie and Beckett (1970) showed that there is a consistent relationship between map scale and the field effort of the soil survey.

It is now common practice to map variables by geostatistical methods. The output from kriging can be on the support of the original data (point kriging) or can be upscaled to 'blocks' by block kriging. The block kriging prediction is of the spatial mean of the target variable across a block of specified dimensions. In principle the size of the block on which data are presented can by varied arbitrarily. In some circumstances the block size may be determined by operational requirements. However, for general purposes, predictions can be presented for blocks of any size.

The same variable, sampled at a fixed intensity, could be presented as estimates for blocks 10×10 m on one map and 100×100 m on another map. The data user might be tempted to assume that the predictions on smaller blocks provide more information than the larger blocks. However, the prediction variance of the block mean diminishes with block size so improvement of the notional resolution of the information is accompanied by a reduction in its precision. This precision can be quantified by the block kriging variance, however this on its own may not serve to indicate whether the block size represents a good compromise between resolution and precision in a particular circumstance such that the resolution reasonably communicates the uncertainty of information to the data user.

In this presentation I show how, in place of the block kriging variance, one can use the model-based correlation between the block kriged estimate and the true spatial mean of the block as a readilly interpreted measure of the quality of block-kriging predictions. Graphs of this correlation as a function of block size, for a given sampling configuration, allow one to assess the suitability of different block sizes in circumstances where these are not fixed by operational requirements. For example, it would be possible to determine a new convention by which block kriged predictions are routinely presented only for block sizes such that the correlation exceeds some threshold value.

Steur, G.G.L. 1961. Methods of soil survey in use in the Netherlands Soil Survey Institute. Boor Spade 11, 59–77.

Bie, S.W., Beckett, P.H.T. 1970. The costs of soil survey. Soils and Fertilizers 34, 1–15.