Exploiting the data explosion using geographically local analyses

S. W. Laffan[1]

(1) School of Biological, Earth and Environmental Sciences, The University of New South Wales, Sydney, 2052, Australia.

Abstract

The explosion in spatial data allows for analyses of much finer spatial detail than was previously possible for applications as diverse as geochemistry, geophysics, crime, epidemiology and biodiversity. In many cases the spatial density of samples makes the application of geographically local analyses routine. Such analyses evaluate a model at each sample location, producing a surface of models and associated diagnostics. This allows far greater insight into the nature of the association between a set of variables than is normally provided by geographically global analyses. In particular, the nature of any correlations can be assessed as they change in different parts of a landscape. Any analysis method can be adapted to be geographically local, but one must still be mindful of the pitfalls of spatial data such as the curse of dimensionality and the fact that geographic data are normally correlated and therefore violate a basic assumption of many conventional statistical techniques. In this talk I will describe some recent developments using a geographically local implementation of the Sparse Grids analysis system to analyse a data set of 57,642 drill cores from the Weipa bauxite deposit in Queensland, Australia. Sparse grids are particularly suited to the analysis of geographic data. They do not assume the data are uncorrelated, they can fit flexible functional forms, and are less susceptible to the curse of dimensionality. The results will be compared with the more commonly used Geographically Weighted Regression (GWR) system, which implements a set of geographically local linear regression models.

Keywords: Spatial analysis; Geographically local analysis; Sparse Grids; Geographically Weighted Regression.