Applying geospatial techniques to temporal data

Jason Lessels*, Thomas Bishop, Michael Nelson

The Faculty of Agriculture, Food and Natural Resources. The University of Sydney. Australia.
*Contact author: jason.lessels@sydney.edu.au

Studies involving water quality often focus on load estimation to quantify the characteristics of a catchment, whilst government guidelines often provide concentration threshold targets. Water quality studies often involve the use of unequally spaced temporal data, which prohibits the use of traditional time series methods. Currently simple linear regression models are the most commonly used to estimate concentration levels through time. The use of such models fail to account for the temporal auto-correlation in the observations or provide meaningful results in regards to threshold guidelines. This paper will demonstrate the use of spatial generalised liner (mixed) models to account for the temporal auto-correlation. There are currently two packages within *R* to provide statistically sound methods to improve water quality estimation through time. The package **geoR** provides the ability to use a general linear model with a temporal auto-correlation structure to estimate concentration through time. The second package **geoRglm** provides the ability to use a generalised linear mixed model (GLMM) to estimate the probability of a threshold being exceeded. Both models account for the temporal auto-correlation, where simple linear regression models have failed. In addition the GLMM provides a new method for the estimation of the probability of threshold exceedence through time.