Geophysical Research Abstracts, Vol. 7, 02635, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02635

Uncertainty Assessment of a Process-Based Phosphorus Model: INCA-P

S. Dean (1), K. Beven (1), P. Whitehead (2), D. Butterfield (2)

(1) Environmental Science, Lancaster University, UK, (2) AERC, Geography Dept., Reading University, UK. (s.dean1@lancaster.ac.uk)

The EC Water Framework Directive (WFD) is a new piece of legislation that will establish an integrated approach to the protection, improvement and sustainable use of Europe's surface and groundwater. One of the issues being addresses in the upcoming WFD is that of diffuse agricultural water pollution. There have been studies reporting on the relationship between diffuse pollution and catchment characteristics, and many models designed to predict diffuse pollution being delivered to a water body. The nutrient phosphorus (P) is believed to be often the limiting factor in eutrophication (Heathwaite and Johnes, 1996). There are many models available which aim to provide stakeholders and decision-makers with predicted P loss from agriculture. Some are based on purely empirical relationships for example the Export Coefficient Model ...(Johnes, 1995) Others take a more conceptual approach for example INCA-P. INCA-P is a process-based, mass balance model that simulates the P dynamics in both the plant/soil system and the stream. It was developed to assess the effects of multiple sources of P on the water quality and aquatic ecology in heterogeneous river systems. (Wade et al, 2002)

The uncertainties inherent in models can be classified as input data errors, initial conditions, structural errors and errors in the evaluation data. Some of these errors are relatively easily allowed for if the nature of the uncertainty is well understood for example a systematic error in the data measurement techniques. Other uncertainties are less easily quantified and corrected for. For example structural error is usually calculated by removing the quantifiable errors from the total error. This obviously relies on the calculation of the other errors being correct.

The Generalised Likelihood Uncertainty Estimation (GLUE) framework (Beven and

Binley, 1992) was used to assess the level of uncertainty within the INCA-P model. The GLUE method has come about following the thesis of equifinality. That is that for any model there are many different parameter sets which will acceptably represent the data. The parameter space is searched and all combinations of parameters which give predictions consistent with the observational data are kept and considered behavioural. An analysis of the behavioural models (as hypotheses about how the system works) can inform as to which parameters are particularly sensitive as well as providing an estimate of prediction uncertainty.