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

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Despite there being many phosphorus models available for the prediction of phosphorus concentrations at differing scales, there has been little effort to quantify the amount of uncertainty present in these predictions. This may be due to the desire to produce deterministic results for end-user operational requirements. However, it is more appropriate to ensure the end-user is provided with as much information as possible in order that they can make more informed decisions within a risk based framework. In this paper an uncertainty analysis of the process-based model INCA-P within the Generalised Likelihood Uncertainty Estimation (GLUE) framework is presented. The framework is applied to a set of data describing the Lugg catchment (885km2) on the border between England and Wales. Daily flow for four catchments and monthly phosphorus (soluble reactive and total) for ten and eight catchments respectively are used to initially assess the uncertainty and sensitivity of 46 of the model parameters. Importantly particular attention is paid to the inherent error characteristics in the observed discharge and phosphorus data. These errors are introduced through an assessment of the errors in the non-perfect stage-discharge rating curves from three stations and from the analytical and representiveness of single phosphorus measurement being used to define a daily observation. We apply different assumptions to the assumed error characteristics and evaluate the impact that these assumption make on the prediction uncertainties.