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Evaluating the predictive power of empirical tools for the simulation of phosphorus loads under uncertainty

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Empirical models (e.g. export coefficient models, risk assessment techniques, and regression models in general) are valuable tools for estimating annual and sub-annual phosphorus (P) loads from catchments to receiving waters. This quantitative step is crucial in the assessment of water quality goals set by the EU Water Framework Directive, for example.

It can be argued that the simplicity of empirical models reflects our imperfect understanding of P transfer processes more correctly than physically-based models. Especially, as we are essentially data limited in the identification of these processes in experiments and modelling. But are empirical models able to pick up the uniqueness of contrasting catchments, where supported by experimental data, if all uncertainties in the model development process are acknowledged?

In this study, structural and parametric uncertainty of empirical P models will be taken into account within a Monte Carlo-based framework as model simulations are evaluated against measured data. A key question will be whether distributions of parameters describing key catchment characteristics (e.g. soil type) can be uniquely defined for catchments where these characteristics vary according to experimental evidence. A main focus will be placed on the quantification of uncertainty in the input and evaluation data during the modelling process.