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## Interactive model evaluation tool based on IPython notebook

Sophie Balemans (1), Stijn Van Hoey (1), Ingmar Nopens (1), Piet Seuntjes (2,3,4)

(1) Ghent University, Faculty of Bioscience Engineering, Department of Mathematical Modelling, Statistics and Bioinformatics, BIOMATH, Ghent, Belgium ([sophie.balemans@ugent.be](mailto:sophie.balemans@ugent.be)), (2) Ghent University, Faculty of Bioscience Engineering, Department of Soil Management, Ghent, Belgium ([piet.seuntjes@vito.be](mailto:piet.seuntjes@vito.be)), (3) Flemish Institute for Technological Research (VITO), Environmental modelling Unit, Mol, Belgium, (4) University of Antwerp, Department of Bioscience Engineering, Antwerp, Belgium

In hydrological modelling, some kind of parameter optimization is mostly performed. This can be the selection of a single best parameter set, a split in behavioural and non-behavioural parameter sets based on a selected threshold or a posterior parameter distribution derived with a formal Bayesian approach. The selection of the criterion to measure the goodness of fit (likelihood or any objective function) is an essential step in all of these methodologies and will affect the final selected parameter subset. Moreover, the discriminative power of the objective function is also dependent from the time period used.

In practice, the optimization process is an iterative procedure. As such, in the course of the modelling process, an increasing amount of simulations is performed. However, the information carried by these simulation outputs is not always fully exploited. In this respect, we developed and present an interactive environment that enables the user to intuitively evaluate the model performance. The aim is to explore the parameter space graphically and to visualize the impact of the selected objective function on model behaviour.

First, a set of model simulation results is loaded along with the corresponding parameter sets and a data set of the same variable as the model outcome (mostly discharge). The ranges of the loaded parameter sets define the parameter space. A selection of the two parameters visualised can be made by the user. Furthermore, an objective function and a time period of interest need to be selected. Based on this information, a two-dimensional parameter response surface is created, which actually just shows a scatter plot of the parameter combinations and assigns a color scale corresponding with the goodness of fit of each parameter combination. Finally, a slider is available to change the color mapping of the points. Actually, the slider provides a threshold to exclude non behaviour parameter sets and the color scale is only attributed to the remaining parameter sets. As such, by interactively changing the settings and interpreting the graph, the user gains insight in the model structural behaviour. Moreover, a more deliberate choice of objective function and periods of high information content can be identified.

The environment is written in an IPython notebook and uses the available interactive functions provided by the IPython community. As such, the power of the IPython notebook as a development environment for scientific computing is illustrated (Shen, 2014).