



SAFE(R): A Matlab/Octave Toolbox (and R Package) for Global Sensitivity Analysis

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Global Sensitivity Analysis (GSA) is increasingly used in the development and assessment of hydrological models, as well as for dominant control analysis and for scenario discovery to support water resource management under deep uncertainty. Here we present a toolbox for the application of GSA, called SAFE (Sensitivity Analysis For Everybody) that implements several established GSA methods, including method of Morris, Regional Sensitivity Analysis, variance-based sensitivity Analysis (Sobol') and FAST. It also includes new approaches and visualization tools to complement these established methods.

The Toolbox is released in two versions, one running under Matlab/Octave (called SAFE) and one running in R (called SAFER). Thanks to its modular structure, SAFE(R) can be easily integrated with other toolbox and packages, and with models running in a different computing environment. Another interesting feature of SAFE(R) is that all the implemented methods include specific functions for assessing the robustness and convergence of the sensitivity estimates. Furthermore, SAFE(R) includes numerous visualisation tools for the effective investigation and communication of GSA results.

The toolbox is designed to make GSA accessible to non-specialist users, and to provide a fully commented code for more experienced users to complement their own tools. The documentation includes a set of workflow scripts with practical guidelines on how to apply GSA and how to use the toolbox.

SAFE(R) is open source and freely available from the following website: <http://bristol.ac.uk/cabot/resources/safe-toolbox/>

Ultimately, SAFE(R) aims at improving the diffusion and quality of GSA practice in the hydrological modelling community.