



How to assess the Efficiency and “Uncertainty” of Global Sensitivity Analysis?

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Sensitivity analysis (SA) is an important paradigm for understanding model behavior, characterizing uncertainty, improving model calibration, etc. Conventional “global” SA (GSA) approaches are rooted in different philosophies, resulting in different and sometime conflicting and/or counter-intuitive assessment of sensitivity. Moreover, most global sensitivity techniques are highly computationally demanding to be able to generate robust and stable sensitivity metrics over the entire model response surface. Accordingly, a novel sensitivity analysis method called Variogram Analysis of Response Surfaces (VARS) is introduced to overcome the aforementioned issues. VARS uses the Variogram concept to efficiently provide a comprehensive assessment of global sensitivity across a range of scales within the parameter space. Based on the VARS principles, in this study we present innovative ideas to assess (1) the efficiency of GSA algorithms and (2) the level of confidence we can assign to a sensitivity assessment. We use multiple hydrological models with different levels of complexity to explain the new ideas.