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# Operational Sensitivity Analysis for Flooding in Urban Systems under Uncertainty

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The runoff process in environmental systems is influenced by various variables that are typically are affected by uncertainty. These include, for example, climate and hydrogeological quantities (hereafter denoted as environmental variables). Additionally, the runoff process is influenced by quantities that are amenable to intervention/design (hereafter denoted as operational variables) and can therefore be set to desired values on the basis of specific management choices. A key question in this context is: How do we discriminate the impact of operational variables, whose values can be decided in the system design or management phase, on system outputs considering also the action of uncertainty associated with environmental variables? We tackle this issue upon introducing a novel approach which we term Operational Sensitivity Analysis (OSA) and set within a Global Sensitivity Analysis (GSA) framework. OSA enables us to assess the sensitivity of a given model output specifically to operational factors, while recognizing uncertainty in the environmental variables. This approach is developed as a complement to a traditional GSA, which does not differentiate at the methodological level the nature of the type of variability associated with operational or environmental variables.

We showcase our OSA approach through an exemplary scenario associated with a urban catchment where flooding results from sewer system failure. In this context, we distinguish between operational variables, such as sewer system pipe properties and urban area infiltration capacity, and environmental variables such as, urban catchment drainage properties and rain event characteristics. Our results suggest that the diameter of a set of pipes in the sewer network is the most influential operational variable. As such, it provides a rigorous basis upon which one could plan appropriate actions to effectively manage the system response.