Consideration of forcing uncertainty on the sensitivity and calibration of a catchment-scale pesticide transfer model

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Résumé

The use of pesticides poses significant challenges to sustainable agriculture and water quality, necessitating effective risk assessment tools. The PESHMELBA model (Pesticides and Hydrology: modeling at the catchment scale) simulates water and pesticide transfer processes at the catchment scale, enabling the comparison of landscape management scenarios and their impacts on water quality.
To be able to use it as a decision-making tool, it is essential to properly quantify its uncertainties, coming from various sources. While parameter uncertainty has been increasingly studied, forcing uncertainties (e.g., rainfall, pesticide application dates and quantities) are often overlooked, potentially leading to parameter calibration that cannot be extrapolated to different forcing conditions.
We study the benefits of a *robust* approach to parameter calibration for the PESHMELBA model. To overcome the extensive computational burden intrinsic to robust calibration methods, we employ a polynomial chaos-based metamodel which approximates the response surface across parameters and emulates the uncertainty of the forcing input. We evaluate the benefits of the proposed method by comparing the robust parameter calibration with classical calibration using a set of new forcing data.

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