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How to embrace big data and uncertainties within reasonable time constraints? A detailed flood study in Flanders

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Progressing towards a sustainable society implies the availability of reliable boundary conditions for various hydrodynamic flood models, including an extensive consideration of uncertainties. With an ever growing availability of data and models, the uncertainty sources are constantly increasing. Hence, an elaborate uncertainty analysis strategy has become a must. One way to deal with part of this uncertainty is by applying an ensemble approach, using different hydrological models in combination with various climate scenarios. However, impact modellers may find the growing number and the increasing length of input series for hydraulic models more challenging, since computing time, reliability of the analysis and project deadlines can cause a conflicting situation. In this context, there is a need for approaches that offer a compromise between computing the vast amount of long input series and adequately addressing the uncertainties within a reasonable time span. We present an approach which reduces the computation time, but simultaneously recognises the importance of robust results and the consideration of the different sources of uncertainty. By a stratification of the probability domain for extreme events (discharges, water levels,...) a set of hydrodynamic boundary conditions is generated. Each of these synthetic events gets a probability of occurrence, which changes according to either the considered confidence level or the considered ensemble member. In addition to the stratification approach, a tool for selecting synthetic events for design is developed. This tool allows end-users to create a subset of synthetic events which can be used as design events for a specific area and are representative for the full set of events. The approach is demonstrated for the River Dender catchment in Flanders using 40 years of hydro-meteorological data, an ensemble of 3 hydrological models and a detailed hydraulic model.