Impact of the models structure uncertainty in flood simulations: 
Simbach case study

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The quantification of model structure uncertainty on hydraulic models is very important for flash flood simulations. The choice of an appropriate model structure complexity and assessment of the impacts due to infrastructure failure can have a huge impact on the simulation results. To assess the risk of flash floods, coupled hydraulic models, including 1D-sewer drainage and 2D-surface run-off models are required for urban areas because they include the bidirectional water exchange, which occurs between sewer and overland flow in a city [1]. By including various model components, we create different model structures. For example, modelling the inflow to the city with the 2D surface-runoff or with the delineated 1D model; including the sewer system or use a surrogate as an alternative; modifying the connectivity of manholes and pumps; or representing the drainage system failures during flood events. As the coupling pattern becomes complex, quantifying the model structure uncertainty is essential for the model structure evaluation. If one model component leads to higher model uncertainty, it is reasonable to conclude that the new component has a large impact in our model and therefore needs to be accounted for; if one component has a less impact in the overall uncertainty, then the model structure can be simplified, by removing that model component.

In this study, we set up seven different model structures [2] for the German city of Simbach. By comparison with two inflow calculation types (1D-delineated inflow or 2D-catchment), the existence of drainage system and infrastructure failures, the Model Uncertainty Factor (MUF) is calculated to quantify the model structure uncertainties and further trade-off values with Parameter Uncertainty Factor (PUF) [3]. Finally, we can obtain a more efficient hydraulic model with the essential model structure for urban flash flood simulation.

