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Uncertainty estimation of simulated water levels for the Mitch flood event in Tegucigalpa

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Hurricane Mitch in 1998 left a devastating flood in Tegucigalpa, the capital city of Honduras. Simulation of elevated water surfaces provides a good way to understand the hydraulic mechanism of large flood events. In this study the one-dimensional HEC-RAS model for steady flow conditions was used to estimate the water level for the Mitch event in the river reaches at Tegucigalpa. Parameter uncertainty of the model was investigated using the generalized likelihood uncertainty estimation (GLUE) framework. Because of the extremely large magnitude of the Mitch flood, no hydrometric measurements could be taken during the event. However, post-event indirect measurements of the discharge and the water level were obtained in two previous studies. To overcome the problem of lacking direct hydrometric measurements, the fuzzy set theory was used to improve the quality of simulations by providing the model with flexibility in selecting behavioral parameter sets and model results. Such simulations allows more reliable predictions for future events if the estimated model parameter sets can reproduce water surface levels well for past events such as Mitch. The results acquired in this study will provide guidelines to deal with the problem of modeling past floods when no measurements were taken during the event, and to predict future large events taking uncertainty into account. The obtained range of the uncertain flood extension will be useful for decision makers.