BUILDING TREATMENTS FOR URBAN FLOOD INUNDATION MODELS AND IMPLICATIONS FOR PREDICTIVE SKILL AND MODELING EFFICIENCY

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Urban landscapes are highly sensitive to flooding due to the density of economic and social assets, and there is increasing interest in localized flood intensity predictions to implement flood risk reduction measures. A number of models have been proposed for unsteady flood flows through urban landscapes, but the data needs and complexity are varied and it is not clear that the benefits of added complexity are justified by improved predictive skill. In this study we compare four methods to model unsteady, multi-dimensional flow through urban landscapes: building resistance (BR), building block (BB), building hole (BH) and building porosity (BP). Each method is applied to the Baldwin Hills, CA urban dam break scenario which offers excellent data for model parameterization, validation and overall performance assessment including observations of flood extent, stream flow, and building damage. Hence, the performance of each method is assessed based on predictive skill, execution time, and the time and expertise required for model set-up. Results show that all four methods achieve high predictive skill using unique unstructured meshes tailored to exploit the strengths of each approach. Differences in localized velocity predictions were observed across these methods and it appears that the BB and BP methods yield more realistic velocity distributions than the BH and BR methods. In terms of data preparation, BR and BB are the simplest to implement while BR and BP are most attractive from a run-time execution perspective. The best method for a particular application will likely depend on data availability and user tolerances for pre-processing and run-time costs.