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Flood inundation mapping uncertainty introduced by topographic data accuracy, geometric configuration and modeling approach

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Floodplain modeling is a recently new and applied method in river engineering discipline and is essential for prediction of flood hazards. The issue of flood inundation of upland environments with topographically complex floodplains is an understudied subject. In most areas of the U.S.A., the use of topographic information derived from Light Detection and Ranging (LIDAR) has improved the quality of river flood inundation predictions. However, such high quality topographical data are not available in most countries and the necessary information is obtained by topographical survey and/or topographical maps. Furthermore, the optimum dimensionality of hydraulic models, cross-section configuration in one-dimensional (1D) models, mesh resolution in two-dimensional models (2D) and modeling approach is not well studied or documented. All these factors introduce significant uncertainty in the evaluation of the floodplain zoning. This study addresses some of these issues by comparing flood inundation maps developed using different topography, geometric description and modeling approach. The methodology involves use of topographic datasets with different horizontal resolutions, vertical accuracies and bathymetry details. Each topographic dataset is used to create a flood inundation map for different cross-section configurations using 1D (HEC-RAS) model, and different mesh resolutions using 2D models for steady state and unsteady state conditions. Comparison of resulting maps indicates the uncertainty introduced in floodplain modeling by the horizontal resolution and vertical accuracy of topographic data and the different modeling approaches.