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Improving flood modeling in semi-urban areas using LIDAR data

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Flood modeling in rural or semi-urban areas is of particular importance for prevention and development of efficient alert systems. In such areas both large (landside) and fine (urban) scales have to be accurately modeled. Nowadays LIDAR data are commonly used when a fine description of the topography is needed. However such high resolution data require special treatments when used to constrain shallow water models. In particular high frequencies in topography may deteriorate the model both in terms of accuracy and computational costs.
A new methodology for modeling floodplain inundation using a 2D shallow water model (DassFlow [1,2]) with fine scale topography data is presented. It involves three main steps: extraction of relevant hydrological structures in LIDAR data (channel, embankments, etc.) and filtering of remaining high frequencies, local mesh refinement and then complex boundary conditions processing.
Our methodology is tested on two sites in South-West of France near Toulouse that suffered from important flooding in years 2000 and 2003 respectively. The benefits of our methodology are enlightened by comparisons with standard methods. It is shown that our results are in good agreement with event reports at different spatial scales (from a few square kilometers to a few acres).

[1] F. Couderc, R. Madec, J. Monnier, J.-P. Vila, D. Dartus, K. Larnier. "Sensitivity analysis and variational data assimilation for geophysical shallow water flows". Submitted.
[2] DassFlow - Data Assimilation for Free Surface Flows. Open-source computational software
http://www-gmm.insa-toulouse.fr/∼monnier/DassFlow/