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Merging LIDAR digital terrain model with direct observed elevation points for urban flood numerical simulation

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In last years, the concern about the economical and lives loss due to urban floods has grown hand in hand with the numerical skills in simulating such events. The large amount of computational power needed in order to address the problem (simulating a flood in a complex terrain such as a medium-large city) is only one of the issues. Among them it is possible to consider the general lack of exhaustive observations during the event (exact extension, dynamic, water level reached in different parts of the involved area), needed for calibration and validation of the model, the need of considering the sewers effects, and the availability of a correct and precise description of the geometry of the problem. In large cities the topographic surveys are in general available with a number of points, but a complete hydraulic simulation needs a detailed description of the terrain on the whole computational domain. LIDAR surveys can achieve this goal, providing a comprehensive description of the terrain, although they often lack precision. In this work an optimal merging of these two sources of geometrical information, measured elevation points and LIDAR survey, is proposed, by taking into account the error variance of both. The procedure is applied to a flood-prone city over an area of 35 square km approximately starting with a DTM from LIDAR with a spatial resolution of 1 m, and 13000 measured points. The spatial pattern of the error (LIDAR vs points) is analysed, and the merging method is tested with a series of Jackknife procedures that take into account different densities of the available points. A discussion of the results is provided.