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Testing a new levee breaching feature of LISFLOOD-FP

Iuliia Shustikova (1), Jeffrey Neal (2), Alessio Domeneghetti (1), Paul Bates (2), and Attilio Castellarin ()

(1) University of Bologna, School of Engineering and Architecture, Civil, Chemical, Environmental, and Materials Engineering – DICAM, Bologna, Italy (iuliia.shustikova@unibo.it), (2) School of Geographical Sciences, University of Bristol, Clifton, Bristol, UK

The increasing availability of high-resolution topographic data and the ever-growing computational potential of workstations enable us to simulate flooding events with a large number of hazard parameters. Low-frequency high-magnitude floods bring additional challenges as flood protection systems (e.g. levees) might collapse due to hydraulic conditions such as high water loads, durations and velocities, or geotechnical factors that weaken structures (e.g. burrowing animal activities). Therefore, it is important to jointly consider the distribution of the inundated zones, potential levee breaching and consequent changes in the hydrograph shape downstream when assessing flood hazard.

In order to reproduce the system behaviour as a response to the levee breach we simulate flooding using the LISFLOOD-FP model (in 2D mode) with a new subroutine. The new subroutine allows simulating levee breaches in one single simulation (which was previously unavailable). In order to evaluate the accuracy and efficiency of the new subroutine we conducted analytical solution on synthetic datasets. The outputs were compared to the identical simulations performed by HEC-RAS (5.0.3). Furthermore, we test the updated model on a c.a. 30km portion of the Po River (Italy) simulating a high-intensity event, which would lead to possible levee breaches. Such addition to the code will eventually allow breach simulations to be undertaken over geographically larger areas in order to capture the inundation patterns and changes in flow hydrographs downstream from the breach (system behaviour). Moreover, such solution is computationally more efficient compared to fully 2D codes and would potentially enhance the preliminary risk assessment on the large scale.