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Evaluation of increased complexity flood inundation mapping methods in flash flood prone areas.

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Floods cause significant material and human damage worldwide. In France, and more particularly in the Mediterranean area, flash floods due to intense rainfall events frequently cause floods with catastrophic consequences on small rivers.

In order to enable the prediction of the consequences of these floods, three automated flood mapping methods, implemented on high-resolution Digital Terrain Models (DTM,) are evaluated and tested:

· A simplified inundation mapping based on the HAND approach (height above the nearest drainage). This method has been implemented at a continental scale in the United States in 2016. The method provides one single average water depth value for each considered river reach; the average reach length is about 1-km in the present application.

· A method consisting in extracting river cross-section geometries from the DTM to build automatically the input files of one-dimensional steady–state hydraulic models: CARTINO method. The density of the cross-sections can be adjusted; it has been set to 50 meters on average for this particular application.

· The implementation of the full 2D hydraulic model Floodos developed in 2017. This model is based on a Lagrangian approach an neglects the inertial terms of the 2D shallow water equations. It is fast processing, especially in steady-state and can therefore be implemented over large areas and on high resolution DTM with reasonable computation times.

The simulations are carried out on a 300-kilometer long river network in South-Western France using the same DTM and reference discharge values. The automatically retrieved flood extent maps are compared with reference maps which have been elaborated based on local expert studies for the implementation of the European Flood Directive. The critical success index and maps of contingency results are used for these comparison.