Final meeting
Comunicazione, Disseminazione e Valorizzazione dei risultati

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New challenges and opportunities in pluvial flooding modelling: the Genoa case study

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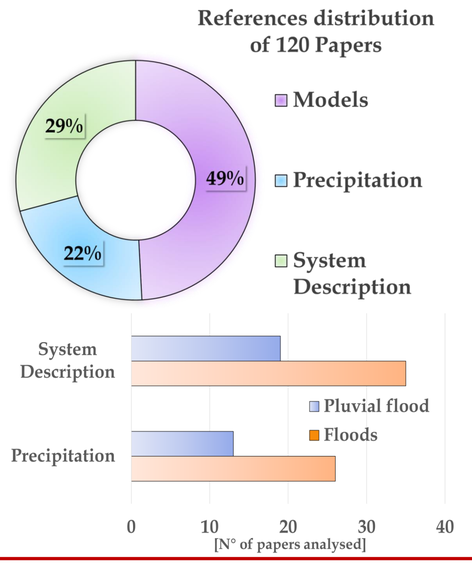
Spokes involved: VS1, WP1-Flood Risk

CONTEXT

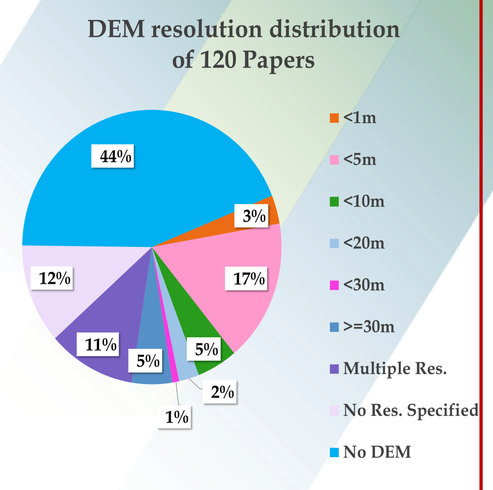
This research examines how input data—especially topographic information—affects the modelling of pluvial flooding in urban areas. Despite advances in 1D, 2D, and coupled 1D/2D modelling tools, challenges remain due to the variable quality and integration of input datasets. A literature review (see the figures on the right) revealed that terrain data, although highly influential on flood simulation results, is often chosen without systematic evaluation. To address this, the study proposes a structured method to assess how different types and resolutions of topographic data influence the accuracy and reliability of pluvial flood models, aiming to improve modelling practices amid growing urban and climatic pressures.

LITERATURE REVIEW and INPUT DATA



Left: Schematic overview of a literature review (120 articles, 2020-2024), focusing on input data characteristics.

Right: pie chart showing the distribution of topographic data usage in the analyzed studies.



CASE STUDY

Fig.1:Schematic map of the study area with points used for sensitivity analysis. Photo A and B: real event of 24/09/2022 (Primocanale)

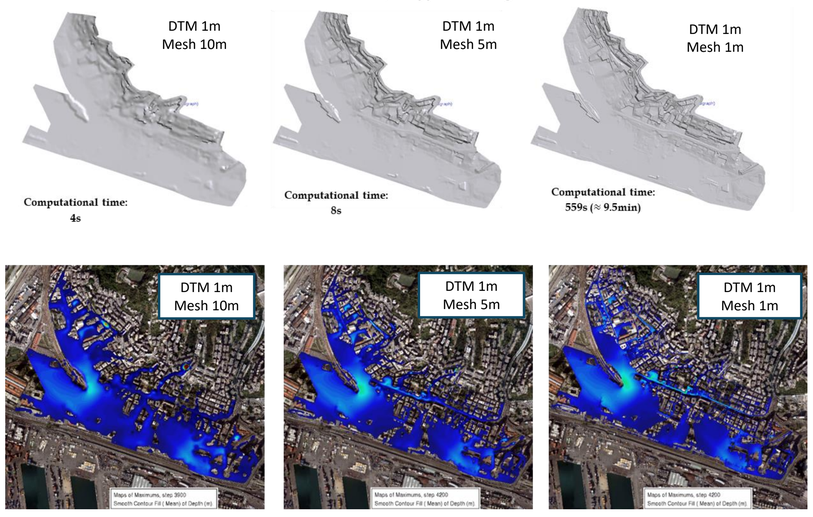
To evaluate more effectively the influence of input-data weighting within the hydraulic models, the case study shown in Fig. 1 (left) was selected. The chosen site is a densely urbanised sector of the Metropolitan Area of Genoa, Italy, which is frequently affected by pluvial flooding triggered by rainfall events with relatively low return periods (T between 1.5 and 3 years). The study area lies in the western part of the city, within the Sampierdarena district, and initially covered approximately 1 km². The domain was later expanded to roughly 1.5 km² to ensure proper inclusion of the stormwater drainage network. This district forms a compact urban cluster positioned between the commercial port and the left bank of the Polcevera River. It also contains three minor watercourses—Fosso Bartolomeo, Fosso Promontorio, and Fosso Belvedere—each of which is partially culverted along its urban stretch, playing a relevant role in local drainage dynamics.

The ROLE of TOPOGRAPHIC INPUT DATA

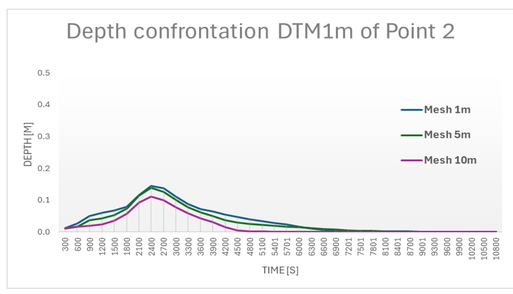
Here the results about the 2D simulation, with a focus on the urbanized area, together with some of the sensitivity analysis executed, in order to understand the best way to model those kind of data.
At the bottom we also have some qualitative analysis and comparison of the detail in the graphical visualization.
Simulation executed through the use of Iber software.

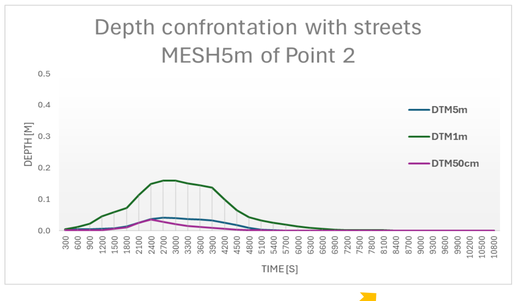
WHOLE AREA (deflux area 0.96 km²)

Same DTM, different grid



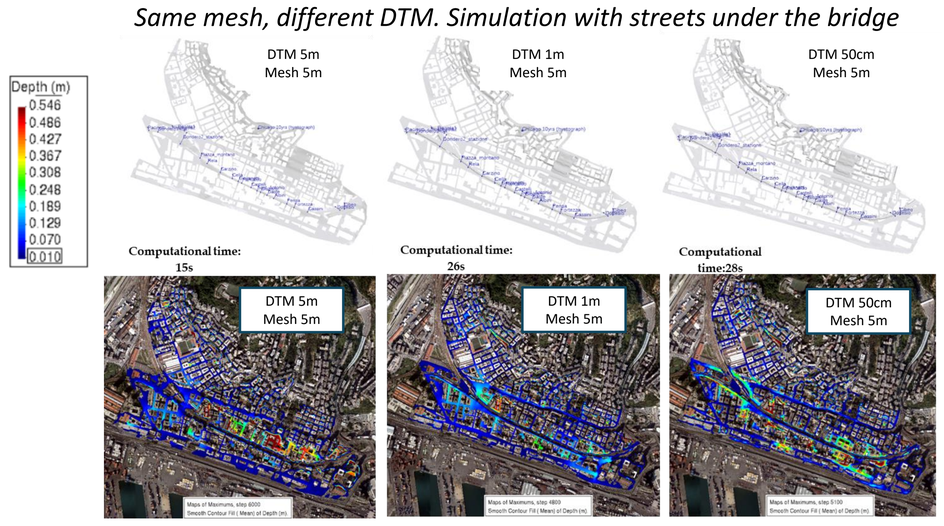
SENSITIVITY ANALYSIS *(Fig.1, point 2)*





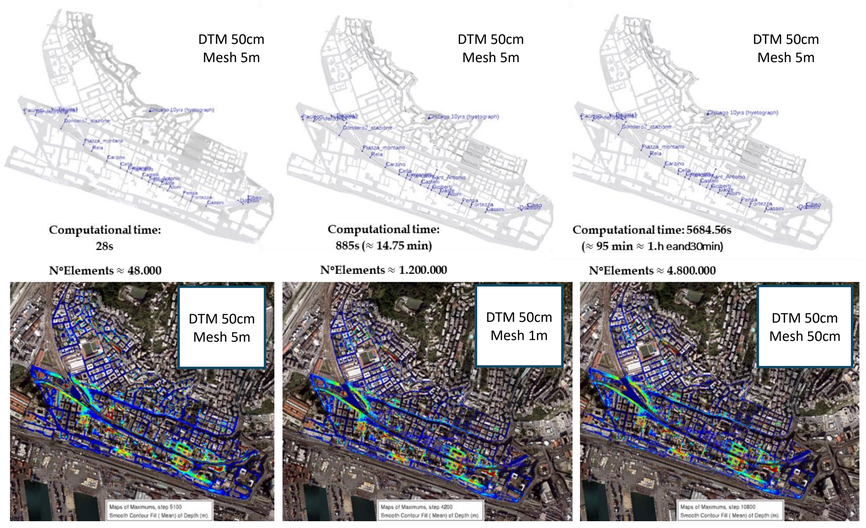
BUILDINGS AS HOLES (deflux area 0.53 km²)

Same mesh, different DTM. Simulation with streets under the bridge

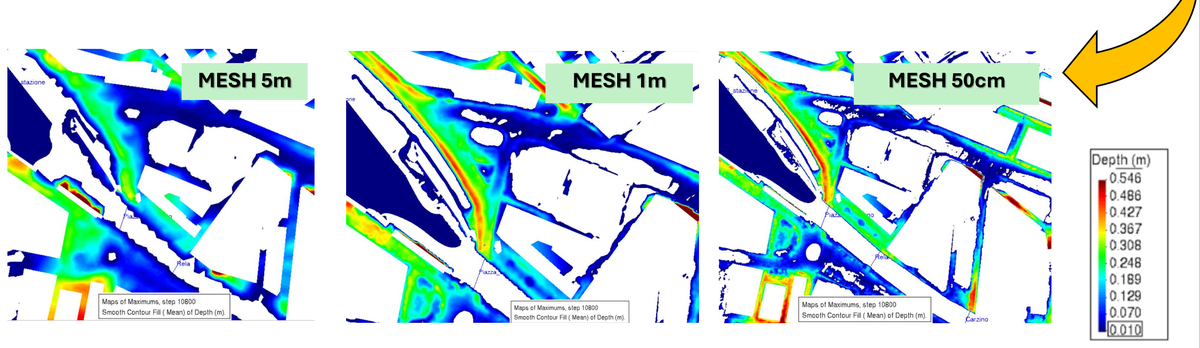


BUILDINGS AS HOLES (deflux area 0.53 km²)

Same 50cm DTM, variation of mesh. Simulation with streets under the bridge



Zoom on Piazza Montano

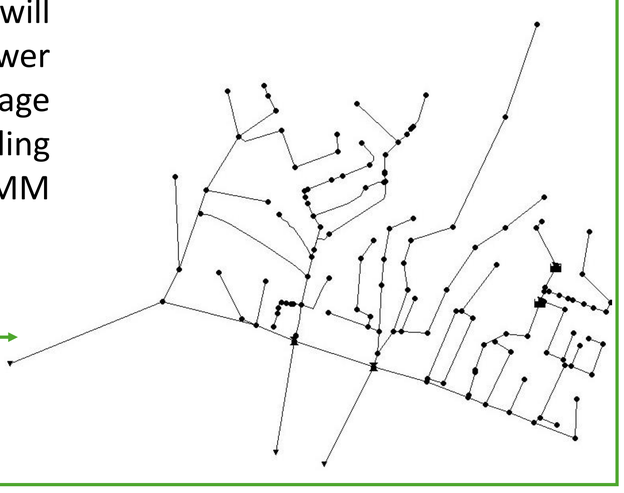


The COUPLING of INPUT DATA: TOPOGRAPHIC and SEWER SYSTEM

In the final steps, the area of study will be amplified to coincide with the sewer network and the natural drainage system, in order to execute a coupling analysis through the use of IBER+SWMM module.

Right:

The sewer network scheme that will be used in the future analysis



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