

A COUPLED HYDROLOGICAL-HYDRAULIC MODELING FRAMEWORK FOR FLOOD SCENARIOS MAPPING AND PREDICTION: THE CASE STUDY OF BASENTO RIVER (SOUTHERN ITALY)

1. Abstract

A robust flood modeling framework is essential for managing flood risk under environment and climate change. Flood hazard hydrodynamic variables (water depth, flow velocity, flood extent evolution) can be computed using numerical flood models together with their spatio-temporal evolution. The aim of the research is to implement an operational framework on the Basento basin in Southern Italy that is based on the cascade use of a physically-based and lumped hydrological model AD2¹, for the estimation of flood hydrographs and a two-dimensional hydraulic model FLORA2D², for the evaluation of the hydraulic characteristics during a flood event.

2. Study Case

The case study is the Basento river basin, which originates in the northern Lucanian Apennines and flows in the Ionian see; with its 149 km, the Basento is the longest river in Basilicata Region.



The aim of this study is to estimate flood discharges hydrograph with given return times at the "SS 106 Jonica" cross-river section and to use these data for mapping flood event scenarios in a test area that extends 7.5 km upstream from the mouth of the river Basento.



Albano R¹*, Mancusi L², Dal Sasso S³, Limongi C¹, Sole A¹

¹ School of Engineering, University of Basilicata, 85100, Potenza, Italy; ² Sustainable Development and Energy Resources Department, Research on Energy Systems S.p.A., 20134 Milano, Italy; ³ DICEM, University of Basilicata, 75100, Matera, Italy; ⁴ * corresponding author: raffaele.albano@unibas.it (R.A.)





for RT of 30 years



for RT of 200 years



for RT of 500 years





5. Conclusions

Consider that the results show the reliability of the models in both calibration and validation phases, (i.e. the hydrological model reach a Nash-Sutcliff efficiency coefficient from 0.86 to 0.91 and the hydraulic model, using a confusion matrix³, shows, in all cases, an accuracy around 70%), we plan to assess the evolution of future floods events in order to support the planning of mitigation interventions and management of emergency or civil protection strategies.

For example, it is possible to estimate the economic damage for event scenarios.



For the event scenario with Return Time of 30 years, the estimate of direct economic damage is approximately €38 million for urban areas and €8 million for agricultural areas.

6. References

- 1. Fiorentino & Manfreda,(1999). La Stima dei Volumi di Piena dell' Adige a Trento con riferimento al rischio di Inondazione", ISBN 88-7740-382-9, Ed. Bios, Vol.2, p.115-122.
- 2. Cantisani et al.,(2014). FLORA-2D: a new model to simulate the inundation in areas covered by flexible and rigid vegetation. Int J Eng, Innov, Techno,l 3(8):179–186
- 3. Scarpino et al.,(2018). Multitemporal SAR Data and 2D Hydrodynamic Model Flood Scenario Dynamics Assessment, ISPRS Int. J. Geo-Inf., 7(3), 105