Geophysical Research Abstracts
Vol. 14, EGU2012-12024-1, 2012
EGU General Assembly 2012

A raster-based model for mapping storm surge flooding in urbanized coastal area: a watershed segmentation approach

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In the last years, due also to the effects of climate change, attention has been focused on the development of specific GIS-based Decision Support Systems (DSS) able to assist coastal managers and policy makers in risk assessment and management.
A wide set of different mathematical models are available for mapping inundation in coastal areas. However, in order to be integrated in a GIS-based DSS such models have to fulfill the following requirements:
• Operate at high spatial resolution for large study areas in order to accurately represent structures and bottom elevation changes (es. River banks, dunes, dikes) ;
• map flood extent providing an indication of both water depth and velocity
• run fast to provide in real time several risk assessment scenarios;
• be fully and easily embedded inside a GIS framework (desktop or web-based);

Simple raster model not only respond to the listed requirements but also show major advantages in terms of their ease of formulation, spatial resolution, computational efficiency and simplified calibration with respect to numerical models.
This contribution presents an innovative simple raster-DEM based flooding model that has been developed using the watershed image segmentation algorithm. Main outcomes of its application in three case studies, Bellocchio (Italy – Emilia-Romagna Region), Santander (Spain) and Gironde (France - Bordeaux), selected from the THESUS FP7 EU project (www.theseusproject.eu) are also discussed.
The results of the proposed methodology, in terms of maps of flooded area and water levels, are compared with the results obtained with traditional 2DH numerical models such as MIKE21 and TELEMAC.