Geophysical Research Abstracts
Vol. 15, EGU2013-12931, 2013
EGU General Assembly 2013

On the investigation of the performances of a DEM-based hydrogeomorphic floodplain identification method in a large urbanized river basin: the Tiber river case study in Italy

Fernando Nardi (1), Chiara Biscarini (1), Silvia Di Francesco (2), and Piergiorgio Manciola (3)

(1) WARREDOC, University for Foreigners of Perugia, Perugia, Italy (fernando.nardi@unistrapg.it, chiara.biscarini@unistrapg.it), (2) Centro Interuniversitario Per L'Ambiente (CIPLA), University of Perugia, Perugia, Italy (silvia.difrancesco@unipg.it), (3) Department of Civil and Environmental Engineering, University of Perugia, Perugia, Italy (manciola@unipg.it)

Floodplains are critical landscape features for their importance in both ecohydrological and socio-economic terms. River valleys are, in fact, the domain where the interdependence of the complex human-environmental interface is more significant. Riparian zones, along perennial channels, where the frequency of saturation is high and most flooding occurs, are also the areas where urban areas and infrastructures (e.g. highways, bridges, railways, etc) are more present. This is mainly due to geomorphologic conditions since those areas are predominantly flat and easier to develop. One of the more challenging issues under changing climatic, environmental and human drivers for implementing efficient current and future urban plans is to accurately and timely identify, map and characterize the potential flooding scenarios of floodplains. This is currently achieved by implementing detailed topographic, hydrologic and hydraulic studies for flood modeling and mapping for different frequencies (i.e. return time), but those activities are rarely implemented at the large (river basin) scale for their economic cost and time of implementation. In addition to that, flood map updating is not as frequent as needed for following the rapid changing land use conditions. As a result, it is very often the case that urban plans are based on heterogeneous and discontinuous flood map information. Nevertheless, several recent researches demonstrated the potential for the use of high resolution digital elevation models (DEMs) to define the floodplain feature by means of automated hydrogeomorphic methods. This means identifying the flood prone area by filtering potentially inundated cells by implementing proper morphological and hydrological analyses. In this work we implemented the flooplain identification model proposed by Nardi et al. (WRR, 2006) which automatically extract the river network and estimate flood water levels according to a predefined scaling Leopold law. Inundated areas are consequently identified as those river buffers, draining towards the channel, with an elevation that is less than the maximum flow depth of the corresponding outlet. Keeping in mind that this hydrogeomorhic model performances are strictly related to the quality and properties of the input DEM and that the intent of this kind of methodology is not to substitute standard flood modeling and mapping methods, in this work the performances of this approach are qualitatively evaluated by comparing results with standard flood maps. The Tiber river basin was selected as case study, one of the main river basins in Italy covering a drainage area of approximately 17.000 km2. This comparison is interesting for understanding the performance of the model in a large and complex domain where the impact of the urbanization matrix is significant. Results of this investigation confirm the potential of such DEM-based floodplain mapping models for providing a fast timely homogeneous and continuous inundation scenario to urban planners and decision makers, but also the drawbacks of using such methodology where the humans are significantly and rapidly modifying the surface properties.