



Delineation of Flood Prone Areas using Digital Elevation Models: Scale Dependence

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The delineation of the areas subject to flood inundations raises complex problems regarding the definition of hydrological forcing and the parametrization of models for flood wave propagation (e.g., *Horritt & Bates*, 2000, 2002). The increasing availability of new technologies for the measurement of surface elevation (eg GPS, SAR interferometry, radar and laser altimetry) led to an increase in the attraction of DEM-based procedures for the delineation of floodplains. In recent years, much effort has gone into the identification of flood prone areas through the use of hydrological and hydraulic studies carried out by River Basin Authorities (public institutions dedicated to river basins management). These studies are generally based on topographic surveys and numerical modelling for the flood wave propagation providing an enormous database rarely used for post processing. *Manfreda et al.* (2006) have recently used the technical documentation, produced during the definition of Hydrogeological Management Plan by the River Basin Authorities, to define a synthetic procedure for the delineation of flood inundation exposure. The relevance of such techniques lies in the ability to characterize, at least at first approximation, portions of the territory where is not possible to run expensive hydrological-hydraulic simulations. The development of simplified methodologies is taken further in the present study to investigate the relationship between areas exposed to flood inundation and the geomorphologic characteristics of the terrain (contributing area, local slope of the surface, curvature, TOPMODEL topographic index) showing a strong correlation with the TOPMODEL topographic index. *Manfreda et al.* (2006) also defined a new expression of the topographical index more suited to the task of delineating flood exposure directly from a DEM analysis. This permitted the definition of a fast procedure for the calculation of flood inundation areas using a threshold level (IT_{ms}) to discriminate between areas exposed to flood inundation and non exposed areas. The objective of the study is to estimate the optimal threshold level for the identification of flood prone areas and the scale dependence of the methodology. This approach was applied over several Italian catchments and sub-catchments of different sizes and using DEMs at resolution changing from 2m up to 230m.