33rd INTERNATIONAL GEOLOGICAL CONGRESS. Oslo 2008
August 6-14th

Session: GHZ-02 Geohazards and risk studies under global environmental change
Location: D8 | Date: 2008-08-13

GHZ02821P

Poster

Extreme Floods modelling comparisons in urban areas: First steps towards including geomorphological analysis in hydraulic numerical tools

Extreme Floods modelling comparisons in urban areas: First steps towards including geomorphological analysis in hydraulic numerical tools

Llorente Isidro, Miguel[1]; Lines Diaz, Clara[2]; Lopez Martinez, Jeronimo[2]; Ruiz Villanueva, Virginia[1]; Diez Herrero, Andres[1]; Lain Huerta, Luis[1]; Ballesteros Canovas, Juan Antonio[1]; Torp Larsen, Peter[3]; Andres Urrutia, Alfonso[4]
[1]Geological Survey of Spain (IGME), Spain;
[2]Autonomous University of Madrid, Spain;
[3]DHI-Spain, Spain;
[4]INCLAM, Spain

Regarding the recently entry into force of the Directive on Floods of the EU, it is compulsory for all EU Member States to have flood maps by 2013. Little criteria has been given and Member States are either adapting their old maps or are early developing them according to previous standards or searching for new tools to provide the requested maps with better quality bases.
The aim of this paper is to show the results obtained using different tools of hydraulic modelling for assessing floods towards a later inclusion of geomorphological analysis in the numerical models. The analysis comprises a theoretical exercise using 1D and 2D models in which all parameters have been tested in order to provide a guide of acceptable/non acceptable divergences. A geomorphological analysis will be carried out shortly after to be included in the model as boundary conditions to be met upstream and downstream, so manmade alterations of the river system may arise. Flood hazard maps will then show natural river system behaviour and altered behaviour as an essential tool for public awareness on flood risk, for augmenting flood risk acceptance, for stimulating resilience improvements and for encouraging non structural protective measures in future urban planning.

The outcomes of the comparison of the different models studied clearly show that 2D models provide more consistent data than 1D models. The lack of turbulence considerations within 1D models causes extreme underestimation of inundated areas. Including structures in 2D models (culverts, bridges) provides significant differences. Although classical 2D square-mesh models take far too long to compute results than 1D models, quality controls on 1D modelling are nearly equal to computing times of 2D models if a tough consistency between both models is desired. A flexible or curvilinear mesh in 2D models improves computing times considerably and purges inconsistencies due to pixel effects along curves. A high accuracy DEM is a key element and therefore a high effort has to be undertaken for

obtaining a reliable elevation surface on which to support hydraulic calculations. The effects of including significant variations (around 20%) in most of the parameters in the simulations prove to be minimum except for the DEM. Particularly noticeable is that inflow and outflow boundary condition variations are minimum at distances of about two hundred meters away of the boundaries (not significantly dependant on pixel size) and can then be considered to have no impact within the modelled area of interest. As a result of this conclusions, the geomorphological analysis should provide information within an area larger than two hundred meters away of the altered zone to guarantee they do have effect on the model. Future tests proposed to be carried out include minimum to maximum water velocity and depth variations needed to build and/or erode different land-forms such as levees, longitudinal bars, crevasse splays, etc.