

Assessment of different Flood Hazard Maps simplified methodologies

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On a global scale, floods account for over 65% of people affected by natural disasters and in many countries they are the most damaging of all natural disasters. Better flood forecasts and warnings, with a greater lead time, together with flood hazard and risk maps are the main tools for adapting to and managing such disasters.

The standard approach for the identification of flood-prone areas is based on the use of detailed hydrologic and hydraulic 1-D or 2-D simulations, but in order to accurately indicate flood-prone areas they require also very detailed Digital Elevation Models (DEMs) and other information based on ground measurements, information that are not readily available in most of the cases. Also, it is well known that this standard approach is very expensive and time consuming.

During the last decade, different research teams have shown that the delineation of flood prone areas can be carried out with fairly good results using DEMs processing, relying on specific topographic and/or geomorphologic features, even for lower resolution and quality DEMs.

The main objective of this paper is to analyze and to test different type of simplified methods for identification of flood-prone areas and respectively for flood hazard maps generation, in order to better understand their limitations and to provide a preliminary assessment on their results, for selected representative River Basins in Romania.

The following types of simplified methods for flood hazard maps generation were investigated:

- methods using only special GIS processing of topographic data provided by the digital elevation models (DEMs), based simply on modified topographic index or using other parameters correlated with flood-prone areas (e.g. distance and relative elevation to the river channel), combined with fuzzy logic system approach;
- simplified hydraulic computation, for converting discharges to water levels.

Most of the GIS processing part was done using GRASS-GIS, an open source geographic information system, using the available specific processing functions (r.hazard.flood, r.stream add-on family, r.fuzzy.system, etc.).

In order to assess the reliability of these simplified approach, the results provided by these methods were compared with the available results obtained by detailed hydraulic simulations, for different floods probability.

As a general conclusion, on the basis of comparing the results obtained using the simplified methods with the flood hazard maps obtained by detailed hydrologic and hydraulic studies, we could observe acceptable good results, especially in the mountainous part of the investigated regions.

The best results are obtained for the hazard maps corresponding to the low probability floods.

Another important finding, is that the results of these simplified methods could be used as valuable information in the general validation process of the results derived by detailed hydraulic simulations, in order to quickly identify areas with significant errors (e.g. due to problems with the model configuration, DEMs errors or even generated by some numerical computation instability).

As next step, the focus will be in the improvement of a combined methodology, using GIS processing together with coupled distributed hydrological modeling and simplified hydraulic methods.