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AIGA: an operational tool for flood warning in southern France. Principle and performances on Mediterranean flash floods.

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Monitoring and flood forecasting on the great French rivers are a legal obligation since 2003. These great rivers, plus the ones monitored by local communities, account for hardly 10% of the national hydrographic network. No measured data are thus available for the very large majority of the French rivers. In order to cope with the needs of flood warning for such basins, the CEMAGREF and Météo-France have developed an operational tool named AIGA. It is based on a regionalized rainfall-runoff model, and can thus be applied to any watershed of the regionalization area including ungauged catchments. The major interest of the method is indeed to yield flood warnings on such basins. AIGA is designed for small watersheds (a few tens to a few hundreds of km^2) affected by flash-floods, where the implementation of a rainfall-runoff model is useful to improve the anticipation delay. The method is currently operational on the French Mediterranean area which is prone to flash-floods.

The method uses distributed data with a resolution of 1 km^2:

-real time estimates of the hourly rainfall provided every 15 minutes by the weather radar network, and calibrated by raingauges,

-daily estimates of the soil water deficit,

-statistical databases of rainfall and runoff providing, for different return periods and durations, (i) rainfall quantiles in any point of the studied area and (ii) runoff quantiles in any point of its hydrographic network. These databases result from the implementation of the SHYREG method, developed by the CEMAGREF, which associates an hourly rainfall model to a rainfall-runoff transformation whose parameters were re-

gionalized on the basis of a very broad sample of basins (approximately 400 for the French Mediterranean area).

The objective of the AIGA method is not to forecast accurate flood hydrographs, which seems far too much ambitious for ungauged watersheds, but to provide flood warnings with a sufficient anticipation delay. The warnings result of the comparison of the real time data with the statistical SHYREG database. The pluviometric risk is thus assessed in each pixel by the comparison of the real time radar data with the rainfall statistical database.

The radar rainfall estimates of rain are then used as inputs for a 1-parameter rainfall-runoff model implemented in each 1-km2 pixel. The pixels are regarded as independent watersheds. The local value of the model parameter is deduced from a modelisation of the soil moisture. The method thus provides a real-time estimate of the flow contribution for each pixel. This information is agglomerated on the basins scale in order to estimate the discharge at the outlet of any catchment. The anticipation delay is directly linked to the catchment size. These discharges are compared to the hydrological statistical database. The method is thus able to assess the hydrological risk.

The levels of the pluviometric and hydrological risks are charted according to a 3-color scale of gravity: yellow for the ordinary events (return period between 2 and 10 years), orange for the large events (return period between 10 and 50 years) ant red for the rare ones (return period more than 50 years). These charts are automatically produced every 15 minutes and are made available in real-time to the Flood-forecasting Services.

The implementation of the AIGA method on several past floods has given good results. It has also enabled to test some modifications in the rainfall-runoff model and in the agglomeration of the flow contribution of each pixel.