



Operational flash flood forecasting chain in Mediterranean catchment using hydrological and pluviometric precursors

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Flash floods are an important problem in most of the Mediterranean catchments resulting from severe thunderstorm typical of these regions. Real time flash flood forecasting is a key element to improve the civil protection achievements to mitigate damages and safeguard the security of people.

In small catchments, in which flooding occurs rapidly, the forecast lead time may not be long enough to allow the use of rainfall-runoff models that transform past observed rainfall into runoff. So in this case the use of flood precursors implemented off-line and compared in real time with observed or predicted rainfall depths results in a practical alternative.

The procedure here presented is based on the combined use of rainfall thresholds and soil moisture maps; the system is composed of several basic component related to antecedent soil moisture conditions, real-time rainfall monitoring and antecedent rainfall.

Rainfall thresholds are derived using an Instantaneous Unit Hydrograph based lumped rainfall-runoff model with the SCS-CN routine for net rainfall. The chosen has been orientated towards this kind of approach because of its simplicity and particularly because of the reduced number of necessary parameters to calibrate the model.

The soil moisture map can be derived either through antecedent rainfall or through historical flood information and provide the probability to produce an extreme event,

given a certain degree of saturation; on the other hand the antecedent soil moisture condition are an indicator for knowing which is the probability to have a flooding with a certain degree of saturation of the soil.

Two different kind of warning can be establish by the system: a first phase of “alert” is identified by a probabilistic soil moisture map derived apart precipitation; a second phase of “alarm” identified by the use of the rainfall thresholds that are a function of the measured or predicted rainfall and of the soil moisture conditions. In a situation of normality, in which it’s assumed that the critical limits will not be exceeded, the system is focalized on the analysis of the probabilistic soil moisture map; if the map suggest that we are in a situation of potential risk the alert phase is activate and the use of the rainfall thresholds indicate when the alarm phase have to be activate. Although this procedure could be used for every kind of catchment, it is thought specially for small and medium ungauged basins, where the application of real time model could be difficult to apply because of the lack of data and of the fast response time of the catchments.

A first application of this procedure has been carried out in catchment in Sicily island, Italy