Geophysical Research Abstracts,
Vol. 11, EGU2009-9926, 2009
EGU General Assembly 2009

A search for model parsimony in a real time flood forecasting system

G. Grossi and M. Balistrocchi

University of Brescia, DICATA, Brescia, Italy (giovanna.grossi@unibs.it)

As regards the hydrological simulation of flood events, a physically based distributed approach is the most appealing one, especially in those areas where the spatial variability of the soil hydraulic properties as well as of the meteorological forcing cannot be left apart, such as in mountainous regions. On the other hand, dealing with real time flood forecasting systems, less detailed models requiring a minor number of parameters may be more convenient, reducing both the computational costs and the calibration uncertainty. In fact in this case a precise quantification of the entire hydrograph pattern is not necessary, while the expected output of a real time flood forecasting system is just an estimate of the peak discharge, the time to peak and in some cases the flood volume. In this perspective a parsimonious model has to be found in order to increase the efficiency of the system.

A suitable case study was identified in the northern Apennines: the Taro river is a right tributary to the Po river and drains about 2000 km2 of mountains, hills and floodplain, equally distributed . The hydrometeorological monitoring of this medium sized watershed is managed by ARPA Emilia Romagna through a dense network of uptodate gauges (about 30 rain gauges and 10 hydrometers). Detailed maps of the surface elevation, land use and soil texture characteristics are also available.

Five flood events were recorded by the new monitoring network in the years 2003-2007: during these events the peak discharge was higher than 1000 m3/s, which is actually quite a high value when compared to the mean discharge rate of about 30 m3/s. The rainfall spatial patterns of such storms were analyzed in previous works by means of geostatistical tools and a typical semivariogram was defined, with the aim of establishing a typical storm structure leading to flood events in the Taro river.

The available information was implemented into a distributed flood event model with a spatial resolution of 90m; then the hydrologic detail was reduced by progressively assuming a uniform rainfall field and constant soil properties. A semi-distributed model, obtained by subdividing the catchment into three sub-catchment, and a lumped model were also applied to simulate the selected flood events. Errors were quantified in terms of the peak discharge ratio, the flood volume and the time to peak by comparing the simulated hydrographs to the observed ones.