Geophysical Research Abstracts,
Vol. 11, EGU2009-3013-3, 2009
EGU General Assembly 2009


# Flood frequency estimation by hydrological continuous simulation and classical methods

L. Brocca, S. Camici, F. Melone, T. Moramarco, and A. Tarpanelli

Research Institute for Geo-Hydrological Protection, National Research Council, Perugia, Italy (l.brocca@irpi.cnr.it, 0039 075 5014420)

In recent years, the effects of flood damages have motivated the development of new complex methodologies for the simulation of the hydrologic/hydraulic behaviour of river systems, fundamental to direct the territorial planning as well as for the floodplain management and risk analysis. The valuation of the flood-prone areas can be carried out through various procedures that are usually based on the estimation of the peak discharge for an assigned probability of exceedence. In the case of ungauged or scarcely gauged catchments this is not straightforward, as the limited availability of historical peak flow data induces a relevant uncertainty in the flood frequency analysis.
A possible solution to overcome this problem is the application of hydrological simulation studies in order to generate long synthetic discharge time series. For this purpose, recently, new methodologies based on the stochastic generation of rainfall and temperature data have been proposed. The inferred information can be used as input for a continuous hydrological model to generate a synthetic time series of peak river flow and, hence, the flood frequency distribution at a given site.
In this study stochastic rainfall data have been generated via the Neyman-Scott Rectangular Pulses (NSRP) model characterized by a flexible structure in which the model parameters broadly relate to underlying physical features observed in rainfall fields and it is capable of preserving statistical properties of a rainfall time series over a range of time scales. The peak river flow time series have been generated through a continuous hydrological model aimed at flood prediction and developed for the purpose (hereinafter named MISDc) (Brocca, L., Melone, F., Moramarco, T., Singh, V.P., 2008. A continuous rainfall-runoff model as tool for the critical hydrological scenario assessment in natural channels. In: M. Taniguchi, W.C. Burnett, Y. Fukushima, M. Haigh, Y. Umezawa (Eds), From headwater to the ocean. Hydrological changes and managements, Taylor & Francis Group, London, 175-179). Specifically, the MISDc structure has been defined by analyzing the hydrologic response of small experimental catchments located in the Upper Tiber basin, also in relation to soil moisture conditions (Brocca, L., Barbetta, S., Melone, F., Moramarco, T., 2009. Catchment runoff prediction based on outcomes from a small experimental basin. International Workshop on Status and Perspectives of Hydrology in Small Basins, Goslar-Hahnenklee (Germany), 30 March-2 April 2009, 4 pp.).
MISDc has been applied to several subcatchments of the Upper Tiber river and the peak flow time series thus generated have been compared with the ones obtained through a classical procedure, where the design hyetograph is transformed in runoff by using an event based hydrological model incorporating the Soil Conservation Service method for abstraction. The comparison in terms of flood frequency has shown that the procedure here presented can be considered more reliable for the frequency discharge predictions, thus providing a valuable tool for flooding risk analysis.