Geophysical Research Abstracts
Vol. 12, EGU2010-10549, 2010
EGU General Assembly 2010
© Author(s) 2010

# Semi-empirical mixed statistical flood forecasting for the Mekong River

Muhammad Khurram Shahzad, Jürgen Ihringer , and Erich J. Plate

Karlsruhe Institute of Technology, Institute for Water and River Basin Management (IWG), karlsruhe, Germany (shahzad@iwk.uka.de)

An ongoing study for improving flood forecasting for the Mekong River by data based modeling by mix of statistical methods and semi-empirical approach has yielded intermediate results, which reduced forecasting errors of previous forecasting models. In contrast to deterministic or semi-deterministic approach, the procedure is adopted to build the physical reality based semi-empirical model from the available data set. The forecast in data scarce basin like Mekong always remained a challenge for hydrologists where with the River of total length of 4000 km and 795000 Sq.km area of catchment has only 32 rainfall gauging stations and 8 runoff gauges in its key contributing catchments with consistent data. Therefore, simple rainfall runoff modeling module is developed for the estimation of inflows contributed by lateral catchments along the River Mekong and added into pre-developed runoff routing algorithm.

The simple 3 parameter Nash-cascade model is applied in non-linear mode with varying runoff coefficients (RC). These runoff coefficients were pre-computed by multiple linear auto-regressions algorithms. It has been found that runoff coefficients increase along the flood season from its onset in May to end in October. However this increase was found highly dependent on previous month's RC values. This RC dependency on previous months is exploited to develop multiple linear regressions for estimation of forthcoming month RC's. These pre-computed monthly RC's were used in Nash-cascade to estimate runoff temporal distribution from daily areal average incremental rainfall for each sub-catchment.

The algorithm was developed to give flood forecast at 4 points in middle Mekong River starting from N.Phanom in Lao-PDR to Stung Treng in Cambodia. There are a total of 4 sub-catchments which contribute runoff into the main Mekong River from its travel along these points. Separate rainfall-runoff Nash-cascade models were developed and added into routing algorithm to compute 1 to 5 day flood forecast at these 4 points. The results of this approach show that that the Nash - Sutcliffe criterion for the forecast is better than 90% in most cases. A more appropriate efficiency criterion named as persistence Index similar in structure to the NS criterion (Berthet et al., 2009; Kitanidis and Bras, 1980a; Kitanidis and Bras, 1980b): the variant of which is also used by Plate (Plate & Lindenmaier, 2008) is utilized to assess the quality of forecast which ranges from 0,5 to 0,75. This criterion based on implication that the deviation of the future observed from the present value should be large relative to the deviation of the observed value from the forecasted value.
References:

Kitanidis PK, Bras RL. 1980a. Real-Time Forecasting With A Conceptual Hydrologic Model.1. Analysis Of Uncertainty. Water Resources Research 16: 1025-1033.
Kitanidis PK, Bras RL. 1980b. Real-Time Forecasting With A Conceptual Hydrologic Model.2. Applications And Results. Water Resources Research 16: 1034-1044.
Plate, E.J. and Lindenmaier, F. (2008) " Quality assessments of forecast", 6th Annual Mekong Flood Forum,Phnom Penh, Cambodia 27-28 May