Geophysical Research Abstracts, Vol. 9, 10355, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10355


# Parameterisation of a distributed hydrological model for application in ungauged basins

**C. Velasco-Forero**, F. Quintero, M. Olvera, C. Corral, and D. Sempere-Torres

Grup of Applied Research on Hydrometeorology (GRAHI). Technical University of Catalonia, (velasco@grahi.upc.es / Fax: (+34) 934054194 / Phone: (+34) 934 017 371)

From a classical point of view, hydrological models can only provide warnings on key points of the river drainage system, previously identified as risk points and with available hydrological records. However new ideas about flood warning and active control strategies require tools able to take into account the particular spatial and temporal characteristics of a given storm, put in interaction them with the geomorphological and hydrographical characteristics of the affected area and produce real-time forecasts of the flood risk whatever it could be the location potentially affected at a given moment. Unfortunately, most of locations sensitive to flash flood occurrences (camping fields, industrial areas, road bridges, etc.) are located in ungauged basins and have no available flow measurements in their proximity. Therefore, the problem of how to issue sensible flow forecasts on ungauged basins should be addressed.

This paper summarizes the research activities made for GRAHI-UPC staff inside of FLOODSite EC-Project (GOCE-CT-2004-505420) related with the estimation of parameters of a distributed hydrological model based on the relationship of physical, geomorphological and hydraulics characteristics of the catchments with their parameters, i.e., based on the link between distributed watershed characteristics and hydrological model parameters.

During this study, a regionalization methodology based on derivation of multiple linear regressions between basins properties to define model parameters was described and tested. This approach allows take advantage of statistical interdependencies between parameters and physical features to obtain prediction expressions for ungauged basins. This technique is similar to some of methods of regionalization published recently (see e.g. Bloschl (2005), Merz and Bloschl (2004), or Moreda et al., (2006)).

The estimation parameters methodology was developed using the distributed conceptual rainfall-runoff model DiCHiTop (Corral, 2004) on the 1000 $km^2$ Besòs river basin. Using information from 5 subcatchments inside the Besòs watershed, parameter calibration was made for all these points. Then distributed characteristics and calibrated parameters of each subcatchment were statistically analyzed to evaluate their relationships. It was focused on: 1) analysis of topography and derived drainage features (for example local slopes) in relation to model routing parameters; and 2) analysis of land use and vegetation cover, as well as topography via the topographic index, as descriptors of runoff generation process.

From these analyses, a set of mathematical relationships, combining some physical features, was defined to estimate those calibrated parameters. After a statistical evaluation of performance of each expression, better-fit mathematical relationships were classified in two groups: (1) recommended or (2) alternative relationships. First group indicates the best performance relationship for each model parameter, and second group is conformed by the other good-fitted, but no best-fit, relationships..

The objective of this study was to identify relationships that allow estimate DiCHiTop parameters in ungauged watersheds around Catalunya Therefore, Anoia basin (904 $km^2$) was selected to evaluate the performance of the recommended mathematical relationship outside of Besòs basin's boundaries. Based on physical features of three watersheds inside of Anoia basin, DiCHiTop parameters were estimated. Comparison between simulated and observed discharges allowed discover, a good agreements of simulated hydrographs with observed peak times indicating a good estimation of routing parameters via prediction expressions, but serious disagreements in the shape of hydrographs suggesting a inadequate estimation of parameters associated with runoff production and infiltration. Additional flow simulations using simple changes in the proposed values of parameters were made and performance of simulations was improved.

Results seem indicate the strongest potential of methodology used in this study to define relationships between model parameters and physical features of basins and to use them to estimate model parameters in ungauged catchments. Also, this study allows identify some problems and difficulties in the implementation process of this methodology, and their prediction expressions, outside of its original definition domain.