



ARE BASIN CHARACTERISTICS RELEVANT FOR THE ESTIMATION OF LUMPED OR SEMI-DISTRIBUTED RAINFALL-RUNOFF MODEL PARAMETERS?

M. Plantier*, M. Bourqui, C. Loumagne, V. Andreassian, N. Chahinian

**DAF Guyane, Parc Rebond, BP 5002, 97305 Cayenne Cedex*

Cemagref, Parc de Tourvoie BP 44 92163 Antony Cedex, France.

Estimation of model parameters has been a major problem since the last two decades and if we want to address this problem in the context of ungauged basins it becomes much more challenging.

We might think that technological progress in collecting spatialized data (Geographic Information Systems (GIS), Digital Elevation Models (DEM), radars...) offers the possibility to take into account the spatial variability of rainfall and watersheds physical characteristics, in rainfall-runoff models without carrying out any measurement in the field. To use this information, the lumped approach can be easily replaced by the semi-distributed approach. Nevertheless, the integration of expensive additional data into models is useless if it does not improve significantly their results.

In this paper, we deal with the impacts of using physical heterogeneities of basins on the performances of lumped and semi-distributed approaches.

Using River Tools, a software for analysing DEMs, and Corine Land Cover, a land use database, we characterised 307 French watersheds through, approximately, forty indexes of pedology, morphology and vegetation. Then, we compared the performances of a rainfall-runoff model with lumped and semi-distributed approaches on

3206 “chimera” basins. A “chimera” basin associates two actual watersheds of similar size to constitute a third, highly heterogeneous virtual basin.

Results indicate that the level of heterogeneity of chimera basins physical characteristics cannot explain all the differences between the two approaches, but based on an average analysis, trends become apparent. Some indexes correlated with rainfall confirm that the semi-distributed approach is more advantageous than the lumped one for basins characterised by high spatial variability of precipitations. Besides, semi-distribution loses its benefit with little and/or high basins. Finally, high heterogeneities of hypsometric integral, agricultural lands, relative response index and, to a certain extent, urbanization and saturability (topographic index), are conditions where semi-distribution is generally more adapted than lumped approach.