In the context of the catchment scale hydrological model, the JGrass-NewAge system is presented as an example of a modern hydrological tool, which allows to cope with the geomorphology of a basin with models of the hydrological response. In particular, in this contribution, a setup of the system containing Hymod for the generation of runoff and CUECAS for flow propagation is compared with setups in which the geomorphology of the basins is accounted for with increasing degrees of complexity. This permits to single out the influence of the topological organization of the network-hillslope system on the overall hydrological response, and put the foundations to assess quantitatively how much information is needed to reproduce acceptable hydrographs.

The JGrass-NewAge system comes with an implementation of the DREAM Bayesian calibrator. In this context, the procedure used in the contribution allows to consider distributions of parameters instead of single set of assumed optimal parameters, and to produce interval of confidence in the forecasted discharges. Two application are shown one with and without the automatic calibration component. In the first one is also shown the influence of the geomorphological structure of the basin on the runoff production and aggregation. In the second application the characteristic ability to reproduce discharge in any point of the river network is used to infer some statistics, and notably, the scaling properties of the modeled discharge. The influence of the spatial heterogeneity of parameters, and the ergodicity of the system, is also analyzed through Monte Carlo simulations.