



Cross-site modelling of the hydrological behaviour of two Mediterranean mountain catchments

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The hydrological behaviour of the Can Vila (0.56 km², Eastern Pyrenees) and the Arnás (2.85 km², Central Pyrenees) catchments have been investigated for several years. Data obtained on both sites have shown some similarities in their hydrological responses characterized by a marked seasonality.

Based on these hydrological similarities, this work uses both catchments for a cross evaluation of the hydrological model TOPMODEL within a GLUE framework in Mediterranean locations. Confidence limits (90%) corresponding to one catchment were first determined from efficiencies (higher than 0.6) obtained in that catchment, and then using the efficiencies obtained in the other catchment.

Results showed that highest values of efficiency were similar for both catchments but the number of simulations with efficiency > 0.6 was much higher for the Can Vila catchment than for the Arnás catchment. In the Arnás catchment, the model efficiency strongly depended on lnT0 and Rv values, whereas in the Can Vila catchment the model was more sensitive to the m parameter.

For the Arnás catchment, the observed discharge was within the confidence limits only 25% of the time when limits were determined from Eff.Arnás > 0.6, but 49 % of the time if limits were determined from Eff.Can Vila > 0.6!. For the Can Vila catchment, the observed discharge was within the confidence limits 97% of the time when limits were determined from Eff.Can Vila > 0.6, but only 33 % of the time if limits were determined from Eff.Arnás > 0.6 .

The results obtained evidenced the difficulties of model transposition from one catchment to a “similar” one. Part of the difficulties encountered are related to the complexity of simulating Arnás discharges with Topmodel for the time period considered here. The significantly lower mean soil depth in Arnás (around 0.5m against 2m in Can Vila), may also increase considerably surface runoff contribution in this catchment in relation to Can Vila, as shown by the high sensitivity of Topmodel to the $\ln T_0$ parameter.

Further similar work using time series in drier or wetter conditions could provide some complementary information and would complete this preliminary test.