



## On the suitability of RCM simulations to study the water balance of large watersheds

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The water resources in the Mediterranean area are characterised by a high variability at several spatial and temporal timescales. Furthermore, it has been shown that increasing human activities and global change can induce dramatic changes in the Mediterranean hydrological cycle, making water resources management more difficult in the future. Future climate projections are widely used to assess the impacts of climate change on water resources in the Mediterranean sector. In this study, the water budget simulated by the regional climate models (RCMs) participating in the FP6 EU ENSEMBLES project (25 km resolution, scenario of emissions A1B) was estimated over a large basin (the Ebro river basin) and at the monthly time step, to assess the quality of the water budget estimations calculated by the last generation of RCMs.

This study shows that high-resolution RCMs simulate well the behaviour of precipitation comparing with observations. However, they have more difficulties in simulating the other two elements of the water budget: evaporation and runoff. Often, the error in the closure of water balance is of the same order of magnitude of the runoff itself. In relation to climate change, the study shows that, according to the simulations studied during the first half of the century, average rainfall will decline slightly over the Ebro basin and the change will manifest itself mainly during spring and summer. The evaporation rate over the Ebro basin stays fairly constant, except for the driest periods of the year (summer). The evaporation over the Pyrenees increases due to a decrease of the snow pack. Runoff will decrease gradually due to reduced precipitation. During spring, river discharge generated in the mountainous region of the basin will be lower due to smaller amounts of snow accumulated during winter.

Despite the greatly improved resolution of the last generation RCMs, this study shows that the estimations of the water budget for local basins as Ebro is not adequate, consequently, other approaches should be needed to estimate the water budget and its response to global warming. An interesting methodology will be to perform a statistical downscaling of the RCM simulation in order to obtain finer spatial and also temporal scales and then to force a land surface model coupled to a hydrological model.