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Projected climate change impacts on water resources in northern Morocco with an ensemble of regional climate models

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Abstract The Mediterranean region is considered as a hot spot of climate change, where precipitation is likely to decrease with the rise of temperature. These changes could have a strong effect in north Africa and notably in Morocco where the agricultural sector is of high importance and very dependent on surface water resources. Therefore, there is a need to quantify the possible climate change impacts on water resources of this region. The most common approach to conduct hydrological impact studies of climate change is to run hydrological models with climate scenarios, usually provided by climate model outputs downscaled to the catchment of interest. In the present study an ensemble of six regional climate model (RCM) simulations from the European project ENSEMBLES at a 25 km resolution is considered to evaluate the climate change impacts on the inflows of the sixth largest dam located in northern Morocco. A quantile perturbation method is used to generate future temperature and precipitation series under the emission scenario A1B. The GR4J hydrological model is first calibrated on different climatic conditions to assess the temporal transferability of its parameters and then run with the perturbed temperature and precipitation series. The ensemble approach allows the projection uncertainties to be evaluated from the spread in the individual RCM simulations. All RCM simulations project a decrease in surface water resources during the extended winter season (November to May), from –9% to –54% depending on the model.

Key words climate variability; climate downscaling; hydrological modelling; Morocco