



Evaluation of high-resolution WRF climate simulations for hydrological variables over Iberian Peninsula

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Meteorological inputs play an essential role in predicting the potential effects of climate change on water resources. Consequently, this study is focused on evaluating the skill of Weather Research and Forecasting (WRF) model to simulate present climate characteristics in term of different variables used for hydrological modeling.

For the 35-yr period (1980-2014), high-resolution simulations have been performed with a spatial resolution of 0.088° over a domain encompassing the Iberian Peninsula, and nested in the coarser EURO-CORDEX domain (0.44° resolution). WRF model was driven by the global bias-corrected climate model output data from version 1 of NCAR's Community Earth System Model (CESM1). In addition, other simulation forced by the European Centre for Medium-Range Weather Forecasts (ECMWF) Interim Reanalysis (ERA-Interim) as "perfect boundary conditions" was also run.

For validation purposes, WRF outputs were compared for Spain and Portugal independently, using two observational data sources: the Spain02 version 4 daily precipitation and (maximum and minimum) temperature gridded datasets, and the PT02 daily gridded precipitation data. The study was carried out at different time scales in order to evaluate the model ability to capture long-term mean values (from annual to monthly) and high-order statistics (extreme events) by directly comparing grid-points. Furthermore, the observational gridded data were grouped using a multistep regionalization to facilitate the comparison in term of several parameters such as the monthly annual cycle or the percentiles of daily values.

The main result is that WRF provides useful information at regional scale, with significant improvement in complex terrain areas such as Iberian Peninsula. Although considerable errors are still observed, the model is able to capture the main precipitation and temperature patterns. The major benefits of using WRF are related to the better representation of extreme events that are an important issue for impact assessment. Therefore, the validation results suggest that high-resolution WRF simulations can be a valuable tool to carry out future climate change projections of meteorological primary variables at regional scale to be used as input of hydrological models.

Keywords: Regional climate modeling, dynamical downscaling, WRF model, Iberian Peninsula, water resources.

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