Geophysical Research Abstracts
Vol. 19, EGU2017-8341, 2017
EGU General Assembly 2017

A comparison of daily precipitation metrics downscaled using SDSM and WRF + WRFDA models over the Iberian Peninsula.

Santos José González-Rojí (1), Robert L. Wilby (2), Jon Sáenz (1), and Gabriel Ibarra-Berastegi (3)

(1) Faculty of Science and Technology, University of the Basque Country, Leioa, Spain (santosjose.gonzalez@ehu.eus), (2) Department of Geography, Loughborough University, Loughborough, United Kingdom, (3) School of Engineering, University of the Basque Country, Bilbao, Spain

Downscaling via the Statistical DownScaling Model (SDSM) version 5.2 and two different configurations of the dynamical WRF model (with and without 3DVAR data assimilation) was evaluated for the estimation of daily precipitation over 21 sites across the Iberian Peninsula during the period 2010-2014.

Six different strategies were used to calibrate the SDSM model. These options cover (1) use of NCEP/NCAR R1 Reanalysis and (2) ERA Interim data for downscaling predictor variables calibrated with data from periods (3) 1948-2009 (NCEP/NCAR R1) and (4) 1979-2009 (NCEP/NCAR R1 and ERA Interim). Additionally, for the ERA Interim case, two different grid resolutions have been used, (5) 2.5º and (6) 0.75º. On the other side, for the NCEP/NCAR R1 case, only the 2.5º resolution has been used. Configuring the SDSM model in this way allows testing the sensitivity of the results to different origins of the predictors, fit to different calibration periods and use of different reanalysis resolutions.

On the other hand, ERA Interim data at the highest resolution was used as the initial/boundary conditions to run WRF simulations with a 15 km x 15 km horizontal resolution over the Iberian Peninsula, for two different configurations. The first experiment (N) was run using the same configuration typically used for numerical downscaling, with information being fed through the boundaries of the domain. The second experiment (D) was run using 3DVAR data assimilation at 00UTC, 06UTC, 12UTC and 18UTC. In both cases, WRF simulations were run over the period 2009-2014, using the first year (2009) as spin-up for the soil model.

Results from the WRF N and D runs and comparable SDSM set up for the period 2010-2014 were evaluated using observations from ECA and E-OBS datasets. In each case, model skill was assessed using seven daily precipitation metrics (absolute mean, wet-day intensity, 90th percentile, maximum 5-day total, maximum number of consecutive dry days, fraction of total from heavy events and number of heavy events defined here as values over the threshold of 90th percentile. Our results show that the SDSM model improves its behaviour when using predictors from the ERA Interim Reanalysis. Improvements are even more impressive when using the 0.75º resolution for ERA Interim. Better results than using WRF D are obtained with this configuration of the SDSM model for mean precipitation and precipitation intensity.

Overall, the analysis reveals the extent to which the skill of SDSM can be improved through judicious choice of downscaling predictor source, grid resolution and calibration period. Moreover, the computationally efficient SDSM tool can achieve comparable skill to WRF over a range of precipitation metrics and the contrasting rainfall regimes of the Iberian Peninsula.