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An Assessment of Observed and Simulated Temperature Variability in Sierra de Guadarrama (Spain)

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This work provides a first assessment of temperature variability from interannual to multidecadal timescales in Sierra de Guadarrama, located in central Spain, from observations and regional climate model (RCM) simulations. Observational data are provided by the Guadarrama Monitoring Network (GuMNet; www.ucm.es/gumnet) at higher altitudes, up to 2225 masl, and by the Spanish Meteorological Agency (AEMet) at lower sites. An experiment at high horizontal resolution of 1 km using the Weather Research and Forecasting (WRF) RCM, feeding from ERA Interim inputs, is used. Through model-data comparison, it is shown that the simulations are annually and seasonally highly representative of the observations, although there is a tendency in the model to underestimate observational temperatures, mostly at high altitudes. Results show that WRF provides an added value in relation to the reanalysis, with improved correlation and error metrics relative to observations.

The analysis of temperature trends shows a warming in the area during the last 20 years, very significant in autumn. When spanning the analysis to the whole observational period, back to the beginning of the 20th century at some sites, significant annual and seasonal temperature increases of 1□/decade develop, most of them happening during de 1970s, although not as intense as during the last 20 years.

The temporal variability of temperature anomalies in the Sierra de Guadarrama is highly correlated with the temperatures in the interior of the Iberian Peninsula. This relationship can be extended broadly over south-western Europe.