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Description of mean fields, interannual variability and extremes in an ensemble of ERA-Interim forced simulations over the Iberian Peninsula: results from the ESCENA project

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The ESCENA (2008-2012) project is a Spanish initiative which applies the dynamical downscaling technique to generate climate change scenarios based on an ensemble of Regional Climate Models (RCMs such as PROMES, WRF, MM5 or REMO) over the Iberian Peninsula and surrounding areas using a resolution of 25 km. Further descriptions of this project can be found in an associated work (Domínguez et al., 2011) also presented in this General Assembly.

The objective of this contribution is to describe the mean fields, the interannual variability and extremes for temperature and precipitation for an ensemble of simulations forced by the high resolution ERA-Interim reanalysis. The results for these variables and indices from the ERA-Interim-forced simulations (1990-2007) are compared to the Spain02 reference data set. This database was developed following the ENSEMBLES E-OBS database methodology but using a much larger amount of daily station data. Thus, it is very suitable over the Iberian Peninsula to be compared with high resolution RCMs data at daily timescale.

Maximum surface air temperature shows cold biases in all models up to -4 K, with relatively clear signal that the modelled maximum temperature is severely underestimated during the coldest seasons, while these biases reduce to -3 K during summertime (JJA). Generally, there is a better agreement between observed and simulated minimum surface air temperature, which is mainly overestimated in the simulations especially during wintertime (DJF). Regarding precipitation, the models tend to show low dry biases during all seasons, especially for autumn in the Mediterranean coast of the Iberian Peninsula. With respect to the interannual variability, the PROMES simulations overestimate the standard deviation of maximum surface air temperature when compared against the Spain02 data, particularly during spring (MAM) and JJA; while the rest of models tend to slightly underestimate the interannual variability. For precipitation, the agreement between observed and simulated interannual variability is better than for temperature in all seasons. All models tend to overestimate the Spain02 standard deviation. In DJF, the differences in the interannual variability are the highest between models both for temperature and precipitation.

The precipitation frequency distributions have been analyzed as well as several precipitation and temperature climate extreme indices related to the spatial features of Iberian Peninsula. The study of some particular extreme events (1994 and 2000 droughts and 2003 heatwave) is also shown. Most of the analyses have been performed for basins. The shape of the simulated precipitation frequency distribution is in good accordance with the Spain02 data and the specific behaviour differs among models. The frequency and intensity precipitation indices present very different spatial patterns, showing the intensity indices a lower spread. Very hot and cold days and nights have been studied through the maximum and minimum temperature indices. Generally, the models underestimate the temperature for cold days (between 1-5 K depending on the model and basin). The models have simulated more properly the 2000 drought than that of 1994 when compared to Spain02 data. The 2003 heatwave that affected particularly the northeastern region of the Iberian Peninsula can be observed in Spain02 data. Most models have a combined summer days and tropical nights index anomaly similar to Spain02 data, with values higher than 9 days in the most affected basins.

Hence, the results point out the ability of these RCMs to reproduce the mean fields, the interannual vari-

ability and climatic extremes in a very complex terrain such as the Iberian Peninsula, showing a great diversity of climatic behaviours.