EMS Annual Meeting Abstracts
Vol. 13, EMS2016-115, 2016
16th EMS / 11th ECAC

Representing the dynamics of European Temperature extremes in CMIP5 historical simulations

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Temperatures extreme events (heatwaves/cold spells) have severe impacts on humans and ecosystems. Such events have increased in Europe within the last decades either in frequency or intensity and, because of their implications, it is important to compute returns periods of temperatures extremes.

We analyse and quantify the biases in European temperature extremes in historical simulations (1900-1999) using model simulations of the fifth Coupled Model Intercomparison Project (CMIP5) and comparing them to the 20th Century Reanalysis (20CR) dataset. Several authors already found some inconsistencies between models and reanalysis. In order to investigate whether this lack of consistency is due to the different dynamical representation in climate simulation, we use the recurrence technique to compute return levels of temperature extremes.

We show that with respect to the traditional approaches, the recurrence technique is sensitive to the change in the size of the selection window of extremes due to the conditions imposed by the dynamics. Eventually, we study the regions which show robust biases with respect to all the techniques investigating the possible origins. To assess whether the biases are due to the resolution, we compare our results as well with regional simulations within the European Coordinated Regional Climate Downscaling Experiment (EURO-CORDEX). Resolution does not change the order of magnitude of biases but their locations.