

EGU2020-5511

<https://doi.org/10.5194/egusphere-egu2020-5511>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



## **Determining the range for CMIP climate projections for Europe using a sub-selected model ensemble based on key model performance indicators and key regional physical processes.**

**Tamzin Palmer**, Carol Mc Sweeney, and Ben Booth

Met Office, Exeter, UK, ([tamzin.palmer@metoffice.gov.uk](mailto:tamzin.palmer@metoffice.gov.uk))

An alternative approach to constraining climate projections based on a probabilistic approach with observational constraints, is to select a subset of models from the ensemble based on their ability to represent key physical processes, along with some indicators of model performance. The method that is presented here is based on the assumption that if a model is unable to reproduce the key factors important for determining the regional climate, the projections from this model are not considered reliable. The projection range for CMIP5 for the three EUCP European regions is assessed using two different subsampled model ensembles.

The first sub-sampling method presented uses the approach of Mc Sweeney et al. (2015), which assessed the models based on their performance for the UK climate. Each model in the CMIP5 ensemble (where data is available), is firstly assessed against these key performance indicators and poor performers eliminated from the selection. Several models also share large portions of code and therefore have similar errors and projections, Sanderson et al 2015a and 2015b quantifies these similarities. This analysis was used identify 'near-neighbours' and further reduce the selection. The applicability of a sub-selection of models based on their performance for the UK climate is assessed for the wider European area and found to reduce the projected range for the Northern European Area (NEU), for precipitation and near surface temperature considerably. The impact on the projected ranges for the Central European Area (CEU) and the Mediterranean (MED) was not as large, suggesting that a different set of physical processes are of primary importance for these regions.

To further investigate the effect of subsampling based on physical processes, a subset of CMIP5 models identified by the approach of Vogel et al. (2018) has been applied for the EUCP European areas. Vogel et al. (2018) looked at the ability of the CMIP5 models to reproduce the correlation between the hottest day of the year and precipitation within the same range as that found in the observations. This approach is designed to subsample the ensemble based on the ability of the model to represent soil moisture feedback processes with the atmosphere. It is thought that these processes are likely to be increasingly important for determining the projected climate in the CEU and MED regions.

Finally, the projection range for the CMIP6 ensemble in the EUCP regions for precipitation and the

near surface temperature will be presented and compared with those for CMIP5.