EGU24-9049, updated on 25 Jul 2024
https://doi.org/10.5194/egusphere-egu24-9049
EGU General Assembly 2024

Constraining internal variability in CMIP6 simulations to provide skillful near-term climate predictions

Rashed Mahmood[1,2], Markus G. Donat[2,3], Pablo Ortega[2], and Francisco Doblas-Reyes[2,3]
[1]Danish Meteorological Institute, Copenhagen, Denmark (rama@dmi.dk)
[2]Barcelona Supercomputing Center, Barcelona, Spain
[3]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

Adaptation to climate change requires accurate and reliable climate information on decadal and multi-decadal timescales. Such near-term climate information is obtained from future projection simulations, which are strongly affected by uncertainties related to, among other things, internal climate variability. Here we present an approach to constrain variability in future projection simulations of the coupled model intercomparison project phase 6 (CMIP6). The constraining approach involves phasing in the simulated with the observed climate state by evaluating the area-weighted spatial pattern correlations of sea surface temperature (SST) anomalies in individual members and observations. The constrained ensemble, based on the top ranked members in terms of pattern correlations with observed SST anomalies, shows significant added value over the unconstrained ensemble in predicting surface temperature 10 and also 20 years after the synchronization with observations, thus extending the forecast range of the standard initialised predictions. We also find that while the prediction skill of the constrained ensemble for the first ten years is similar to the initialized decadal predictions, the added value against the unconstrained ensemble extends over more regions than the decadal predictions. In addition, the constraining approach can also be used to attribute predictability of regional and global climate variations to regional SST variability.