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Run time bias correction of CanESM5 and its impact on seasonal forecast skill

CanESM5, the Canadian Centre for Climate Modelling and Analysis (CCCma) Earth system model contributing to CMIP6, is among CMIP6 models having unusually high climate sensitivities. In addition, CanESM5 represents key aspects of ENSO variability, such as the amplitude and seasonal variation of equatorial Pacific SST anomalies, less realistically than the older CCCma model version CanCM4 that is currently used operationally for seasonal and decadal prediction. These model attributes may at least partially explain why CanESM5 skill is notably lower than CanCM4 for seasonal prediction of ENSO and decadal prediction of global temperature.

In an effort to improve the performance of CanESM5 for seasonal and decadal prediction, a run-time bias correction procedure has been developed whereby tendency corrections are applied to three dimensional atmospheric temperature, specific humidity and horizontal winds, along with oceanic temperature and salinity. These tendency corrections consist of seasonally varying climatologies of terms that relax these variables toward reanalysis values in separate data-constrained runs. Application of the corrections substantially reduces biases in CanESM5 runs, for example in SST and surface salinity, and improves the simulated seasonal cycles of equatorial Pacific SST and ENSO-related SST variance.

In addition to the bias correction method and its effects on CanESM5 simulations, this presentation will examine impacts on seasonal and decadal prediction skill for default and optimized implementations of the correction method, and for a perturbed parameter version of CanESM5 in which historical warming and ENSO amplitude are more realistic than in the CMIP6 version.

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