



*Supplement of*

## **New model ensemble reveals how forcing uncertainty and model structure alter climate simulated across CMIP generations of the Community Earth System Model**

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Supplemental Figures.

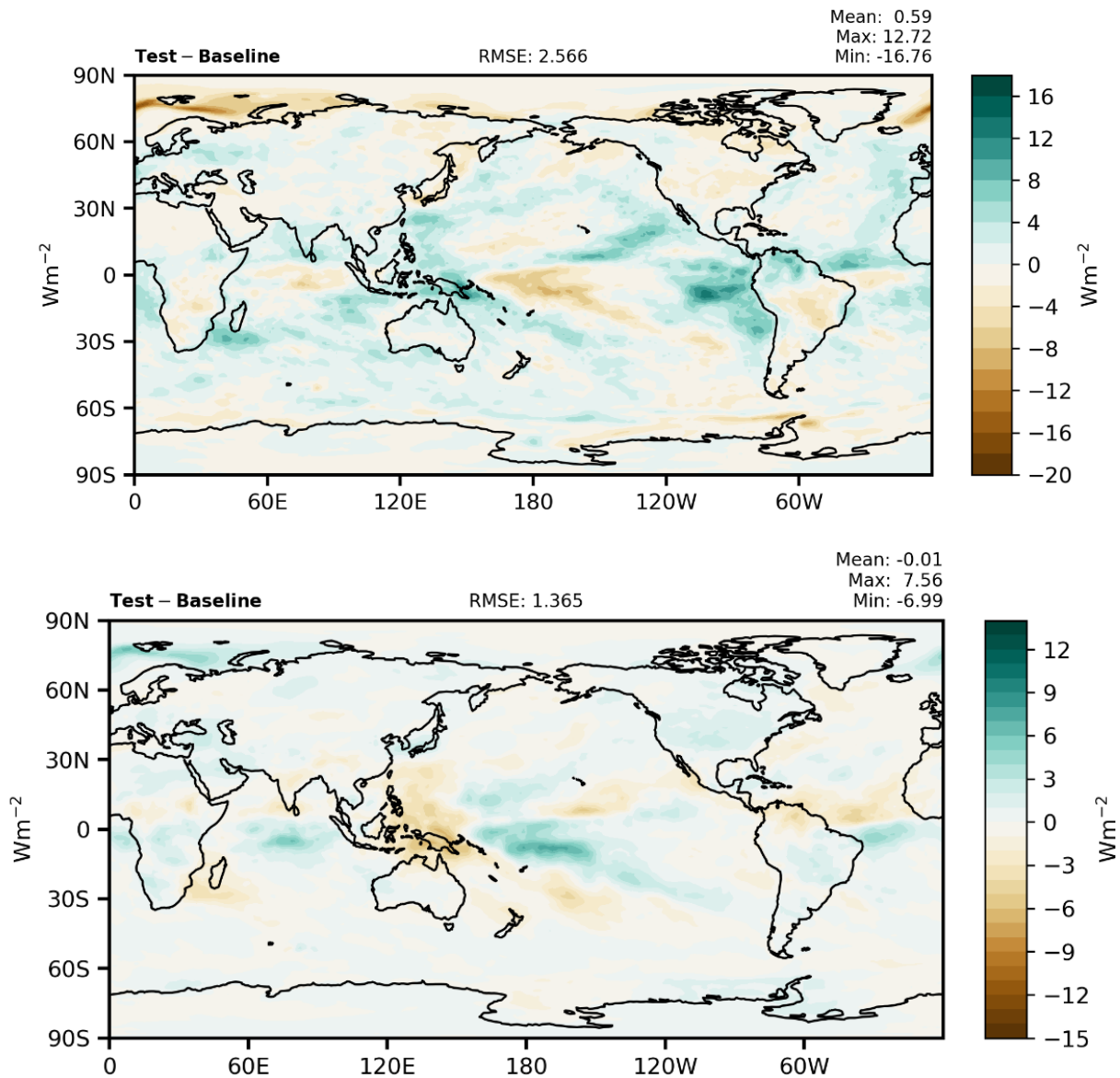


Figure S1. The influence of pre-industrial model tuning on cloud radiative forcing. (Top panel) The difference in shortwave cloud forcing between a 10-year control simulation with  $\text{clubb\_gamma\_coef}=0.318$  and a 10-year control simulation with  $\text{clubb\_gamma\_coef}=0.308$ . (Bottom panel) The same but for longwave cloud forcing difference. Note that because of the short nature of the runs, changes within polar regions are likely not significant.

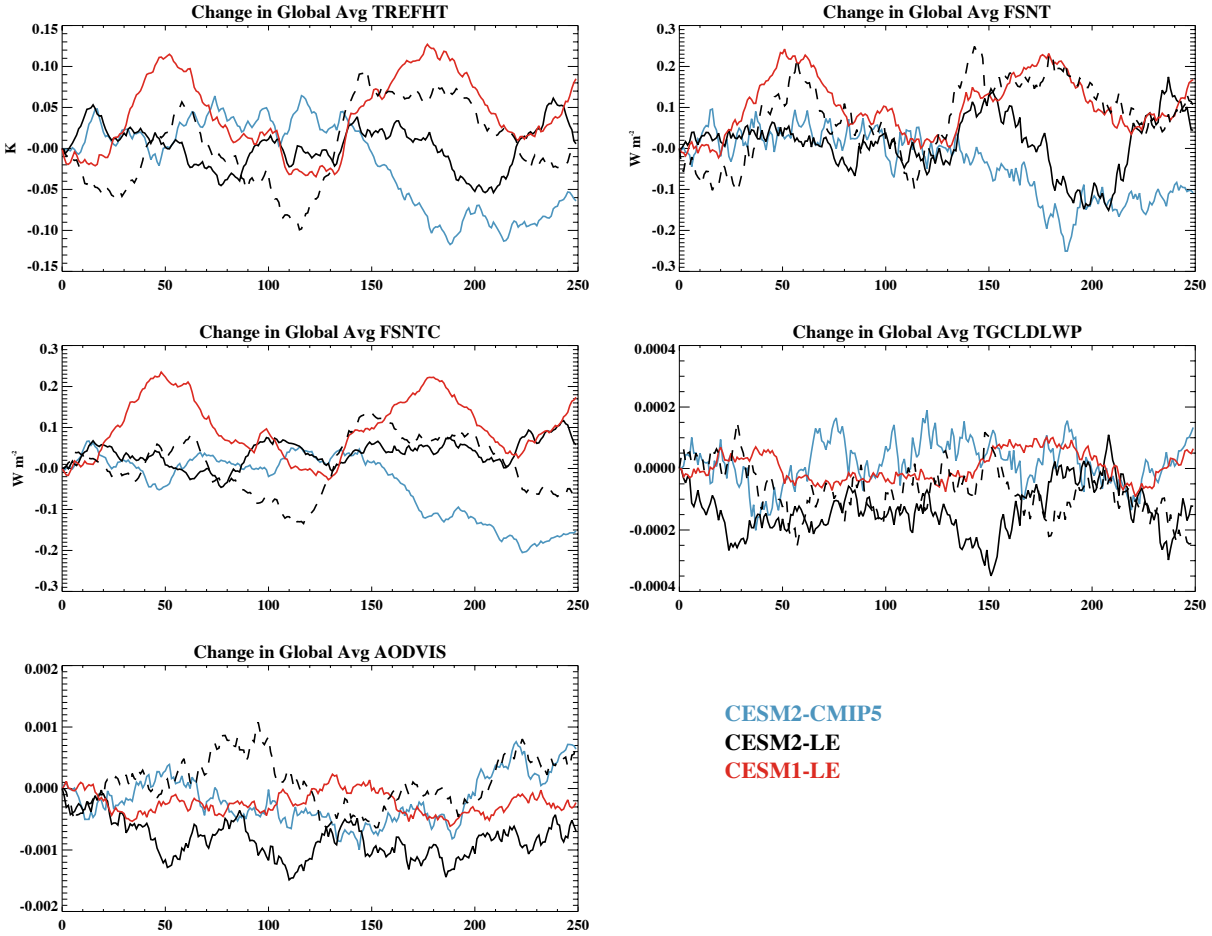


Figure S2. The timeseries of anomalies of global mean properties from the pre-industrial control integration starting from the time at which historical runs were initialized in the year 1850 for the CESM2-CMIP5 runs (blue), CESM2-LE (black) and CESM1-LE (red). For the CESM2-LE simulations, two lines (solid and dashed) are shown because historical runs were initialized at different periods from the pre-industrial control with the macro-initialization method. Values shown are for global mean anomalies of (a) surface air temperature, (b) net shortwave radiation at the top of the atmosphere, (c) net clear-sky shortwave radiation at the top of the atmosphere, (d) cloud liquid water path, and (e) aerosol optical depth.