

Supporting Information for "Equilibrium climate sensitivity and Transient Climate Response biased low in historical simulations of CMIP6 models"

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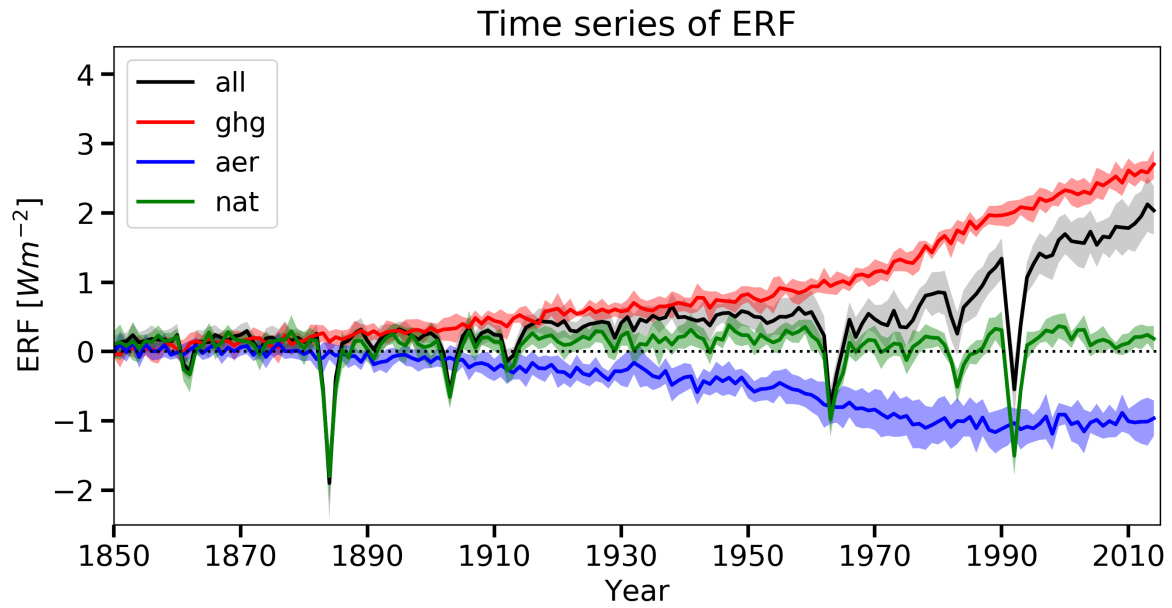


Figure S1. Time series of historical effective radiative forcing estimated from RFMIP simulations. Thick lines denote multi-model means, shadings denote one standard deviation across models.

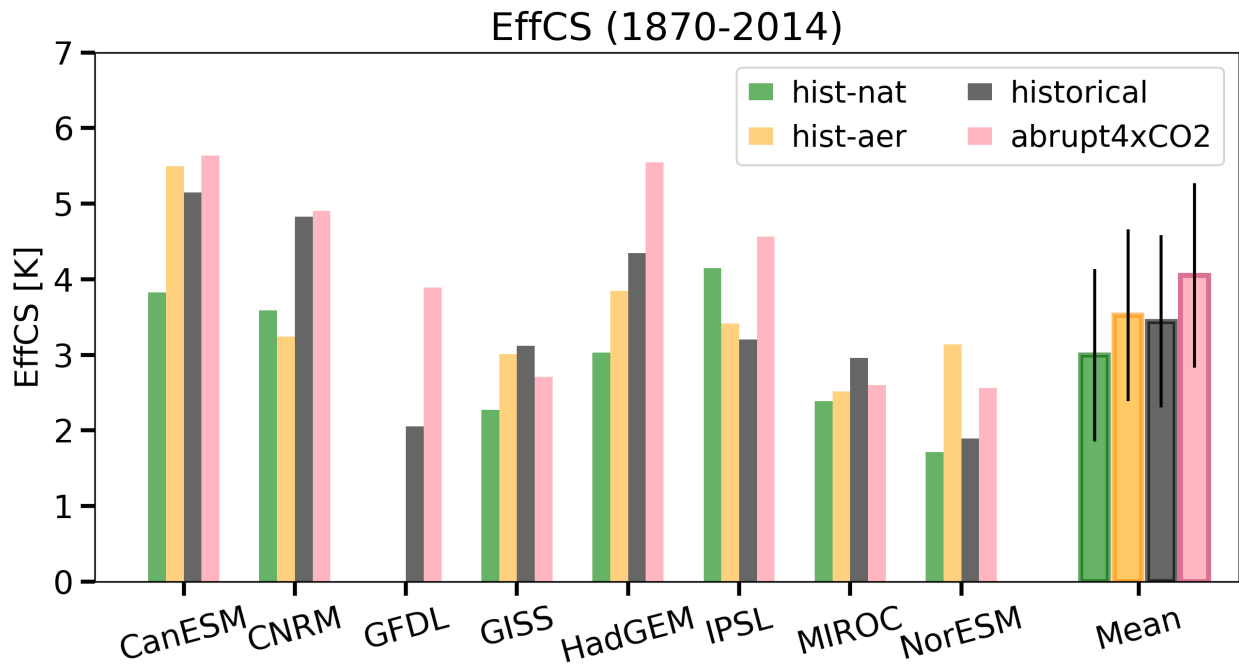


Figure S2. Similar to Figure (1b), except $\text{EffCS}_{\text{his}}$ estimates are from historical energy budget constraints within historical non-GHG simulations. Yellow bars denote the values of $\text{EffCS}_{\text{his}}$ from *hist-aer* simulations, and green bars denote the values of $\text{EffCS}_{\text{his}}$ from *hist-nat* simulations. Note that GFDL-CM4 currently does not have single-forcing historical simulations available.

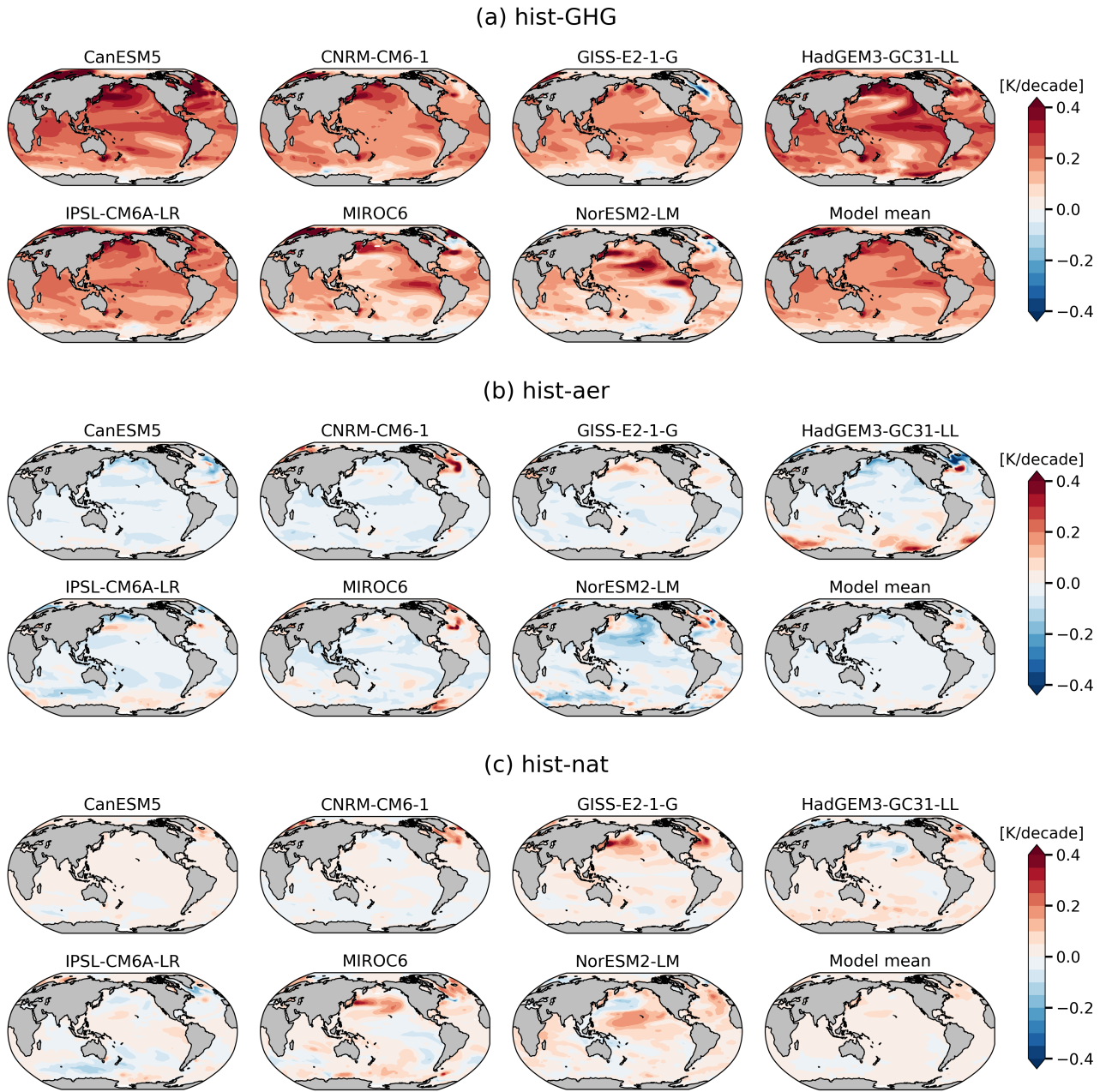


Figure S3. Similar to Figure 2(b), patterns of SST linear trends over 1979 - 2014 from (a) *hist-GHG*, (b) *hist-aer*, (c) *hist-nat* simulations.

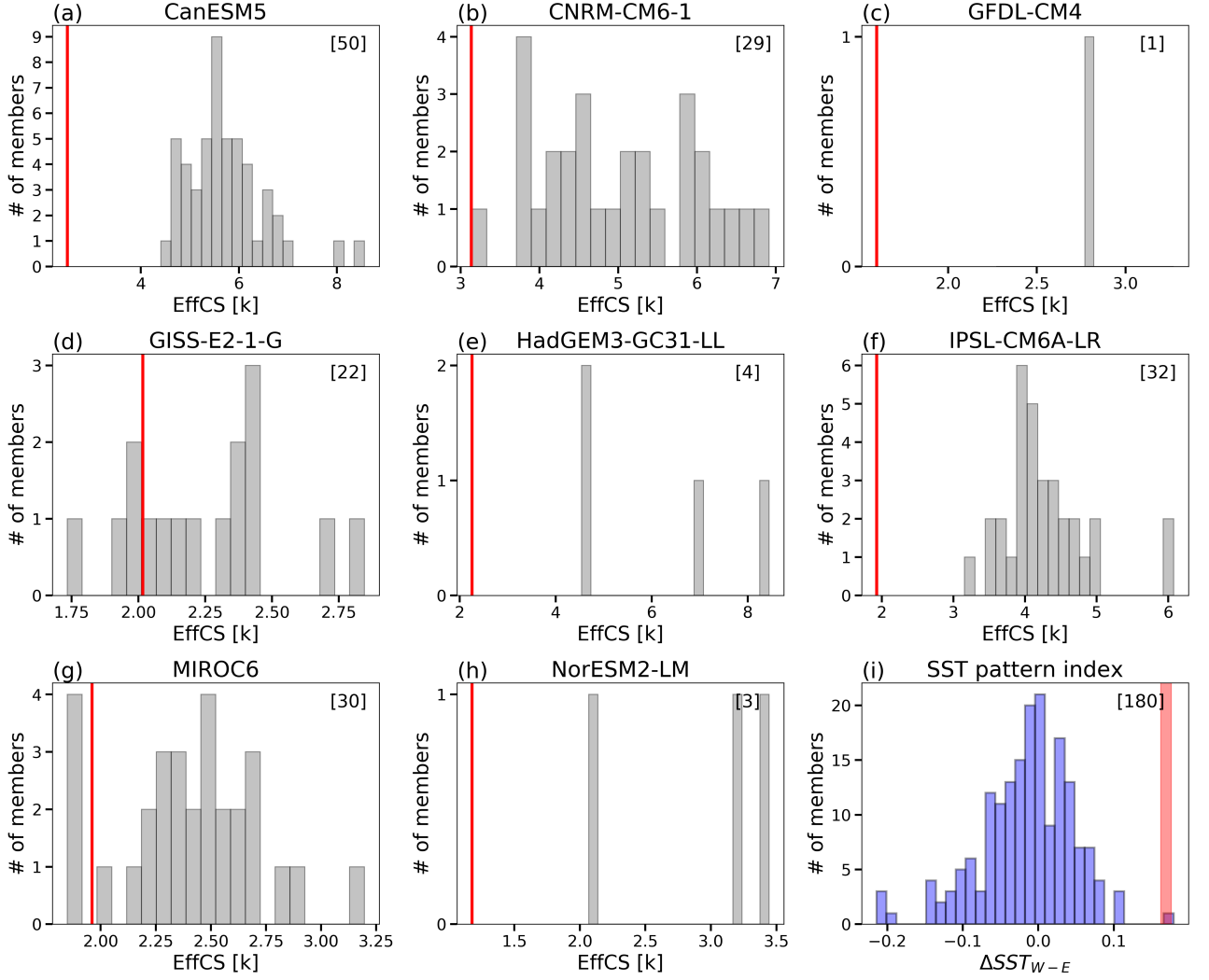


Figure S4. (a - h) $\text{EffCS}_{\text{his}}$ from 1979 – 2014 of all available members of *historical* simulations (black bar) and *amip* simulations (red line) for each of the 8 models. (i) The tropical Pacific zonal SST gradient ($\Delta S_{T_{W-E}}$) over 1979 – 2014 (defined in Watanabe et al., 2021) from all models historical ensemble members (blue bars) and observations (red shading). The observations include 4 datasets: HadISST1 (Rayner et al., 2003), AMIP-II (Hurrell et al., 2008), COBE-SST2 (Hirahara et al., 2014), ERSSTv5 (Huang et al., 2017). The red shading denotes the mean $\Delta S_{T_{W-E}} \pm$ one standard deviation across 4 observational datasets. The number in the top right corner in each panel denotes the number of total model ensembles plotted.

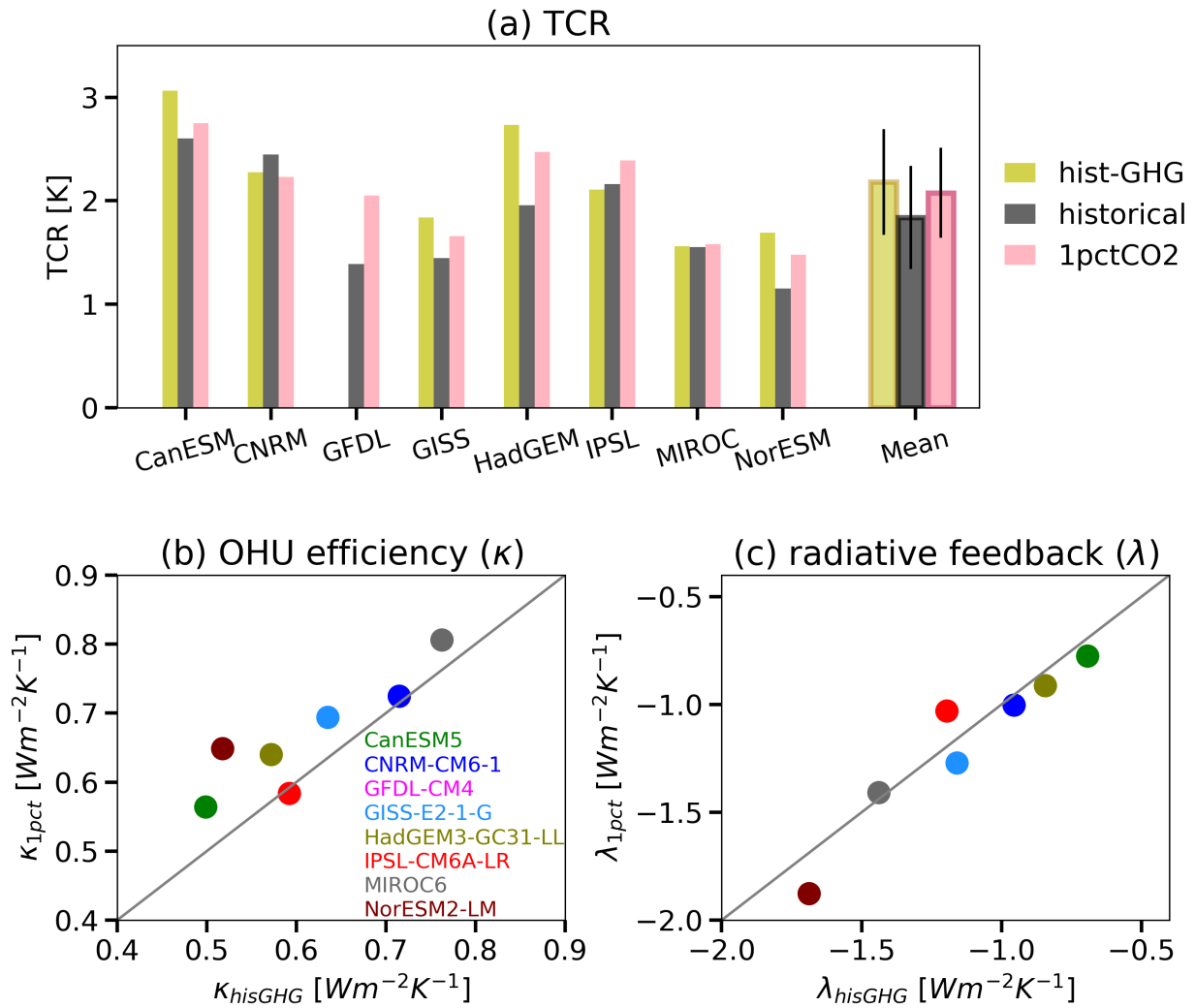


Figure S5. Same as Figure 3, except in (a) yellow bars denote TCR_{his} values from *hist-GHG* simulations, and in (b, c) κ_{his} and λ_{his} values from *hist-GHG* simulations

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