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An overview of the E3SM version 2 large ensemble and comparison to other E3SM and CESM large ensembles

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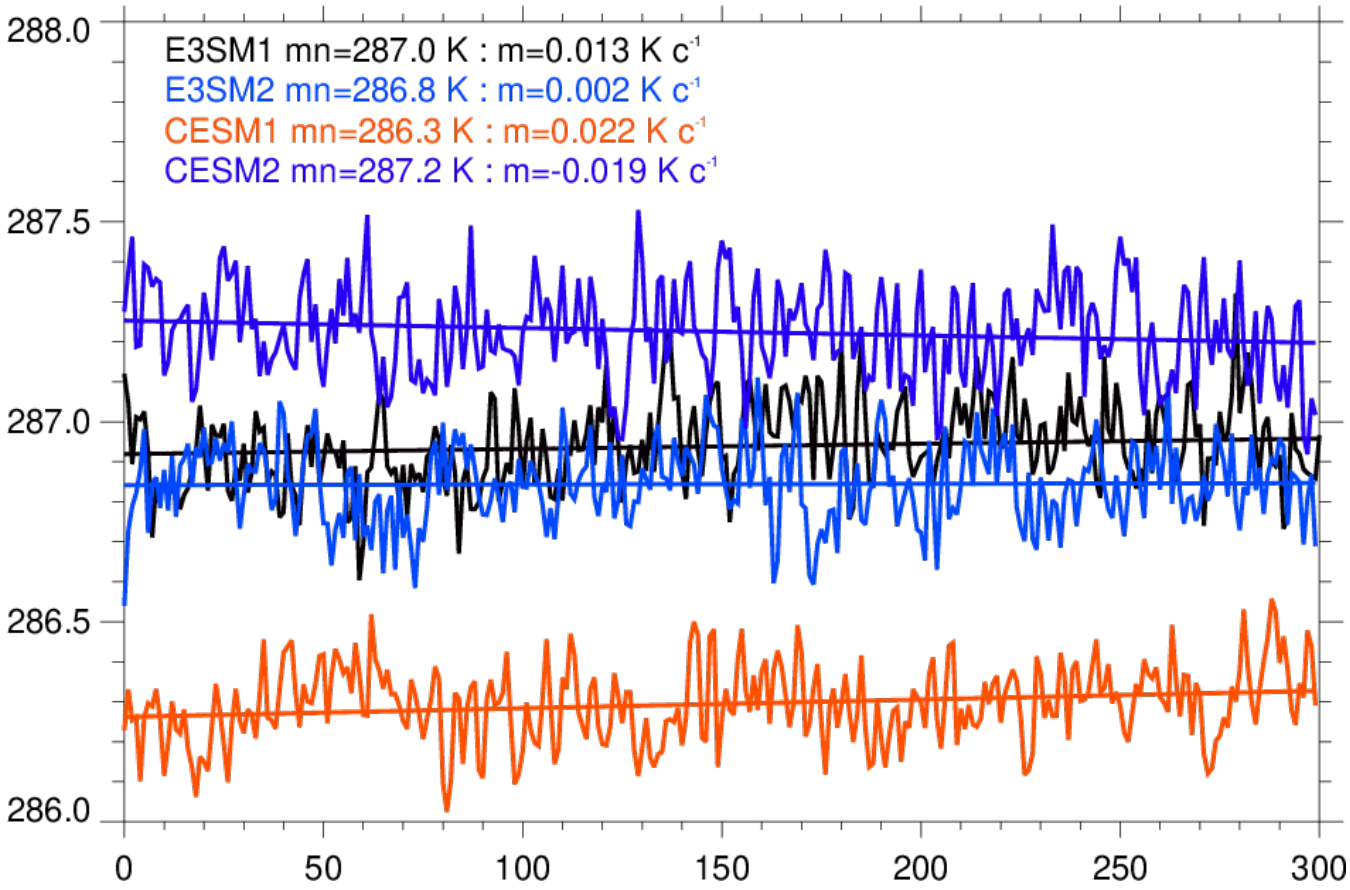

Figure S1: **Time series of PI global T_{2m} (K) in the LEs, including their mean (mn) and linear trends (m).**

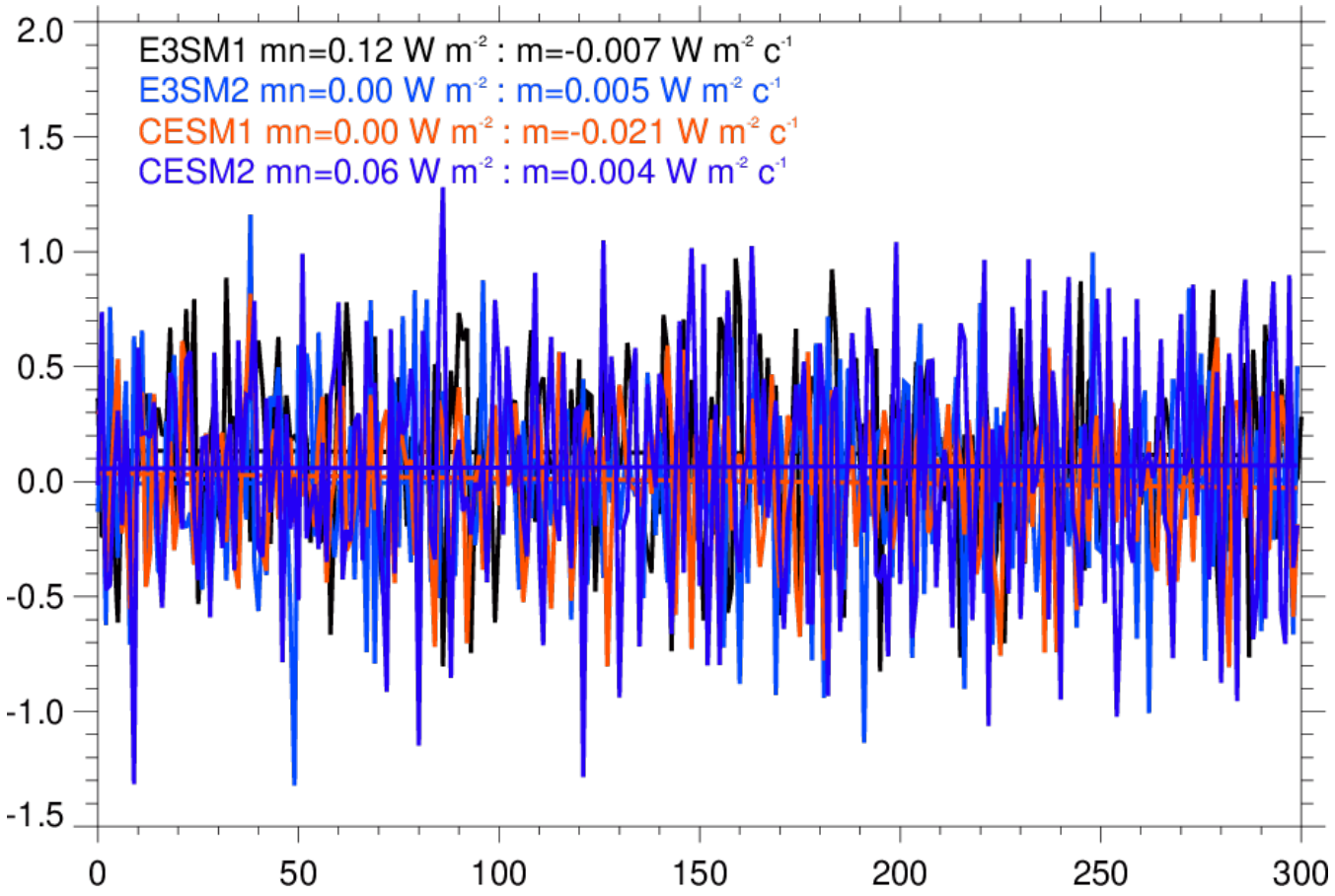

Figure S2: **Time series of PI global R_T (W m^{-2}) in the LEs, including their mean (mn) and linear trends (m).**

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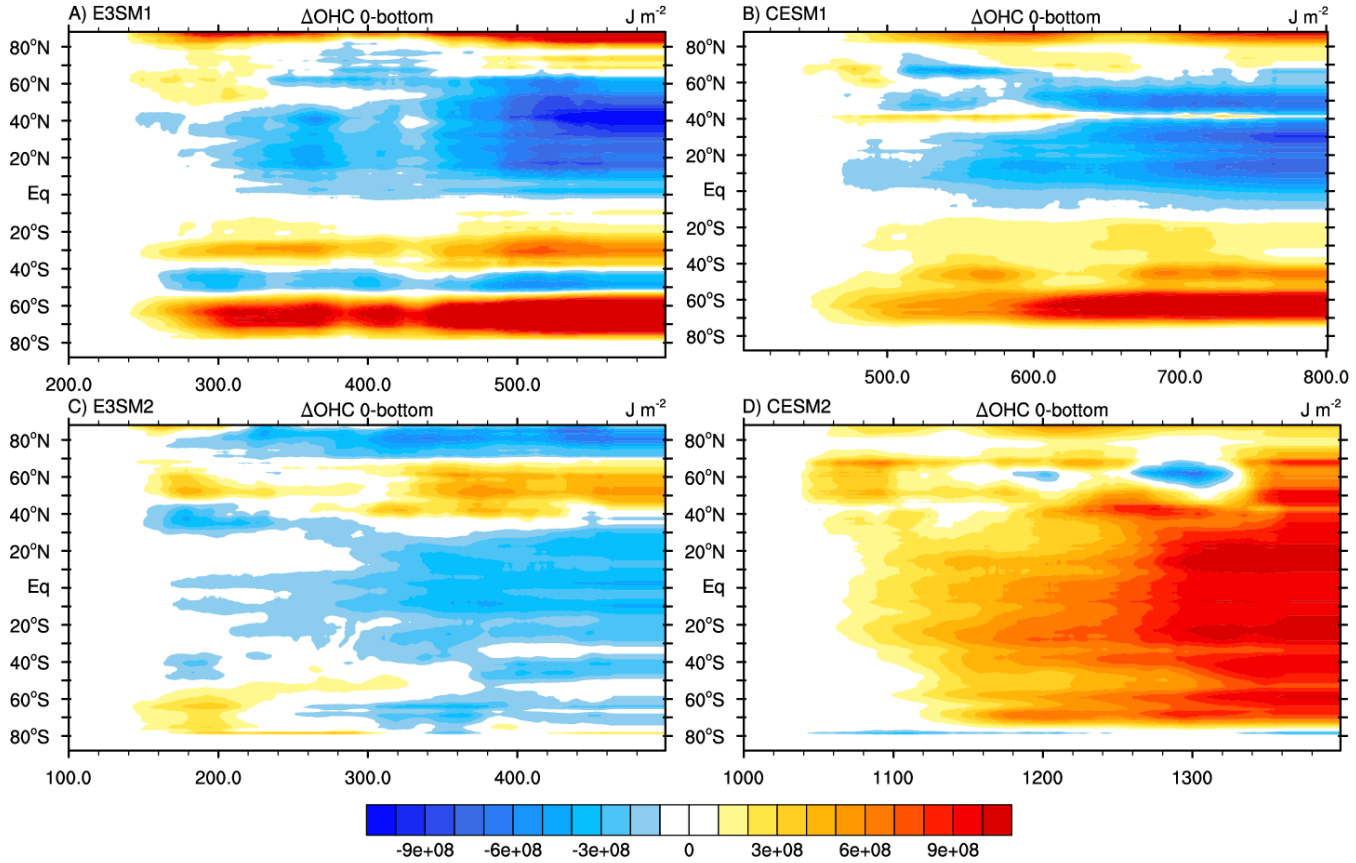

Figure S3: **Time-latitude evolution of zonal-mean ocean heat content in the preindustrial simulations for the full-depth ocean in the E3SM1 (a), E3SM2 (b), CESM1 (c), and CESM2 (d), respectively, after the approximate time of the ensemble initialization, which in some cases varies by ensemble member. In cases of variable initialization dates, an approximate mean date is chosen (years 1000 for CESM2, 200 for E3SM1, and 100 for E3SM2).**

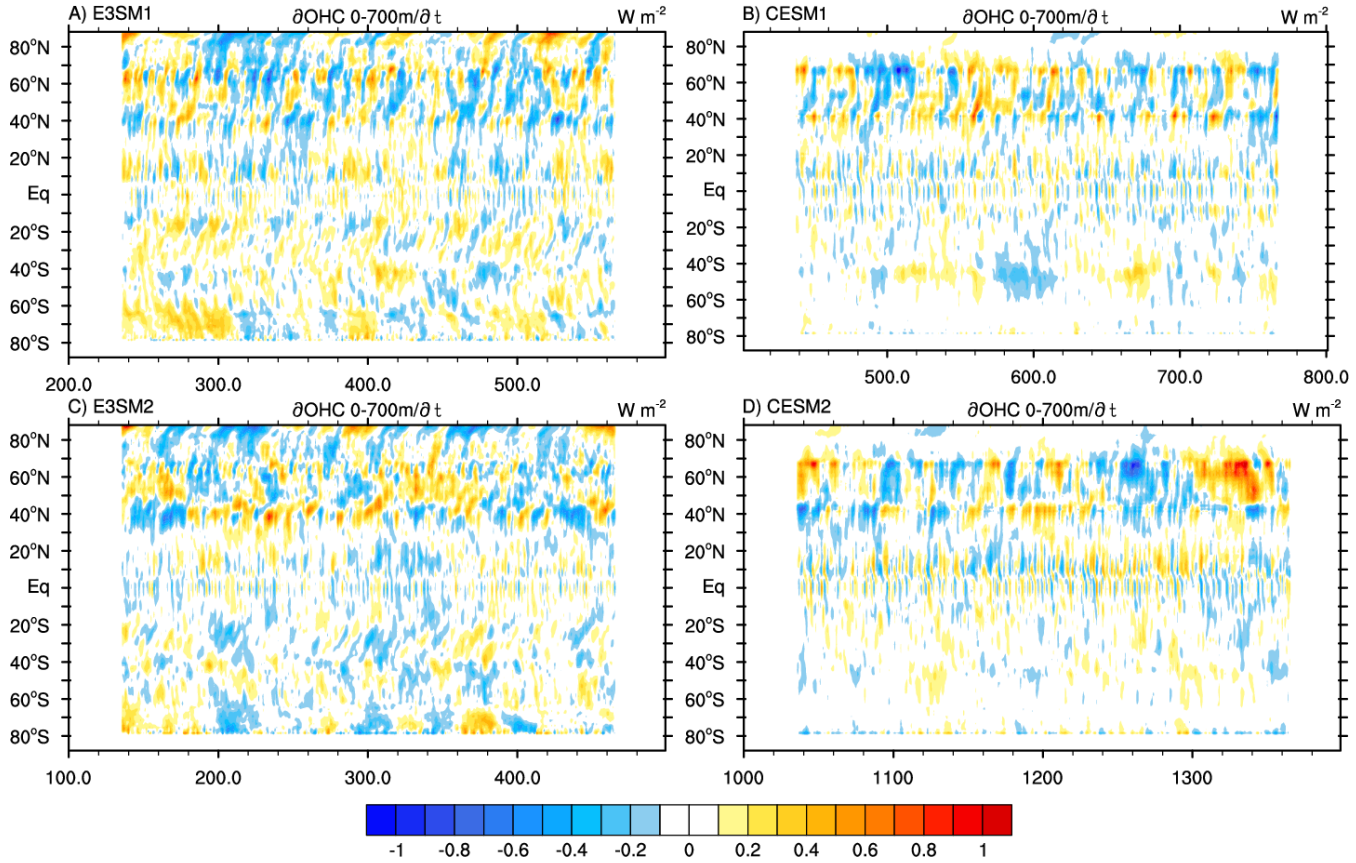

Figure S4: Time-latitude evolution of zonal-mean ocean heat content tendency in the preindustrial simulations for the surface through 700 m depth in the E3SM1 (a), E3SM2 (b), CESM1 (c), and CESM2 (d), respectively, after the approximate time of the ensemble initialization, which in some cases varies by ensemble member. In cases of variable initialization dates, an approximate mean date is chosen (years 1000 for CESM2, 200 for E3SM1, and 100 for E3SMv2). A 10-yr smoothing has been applied to reduce the influence of internal variability.

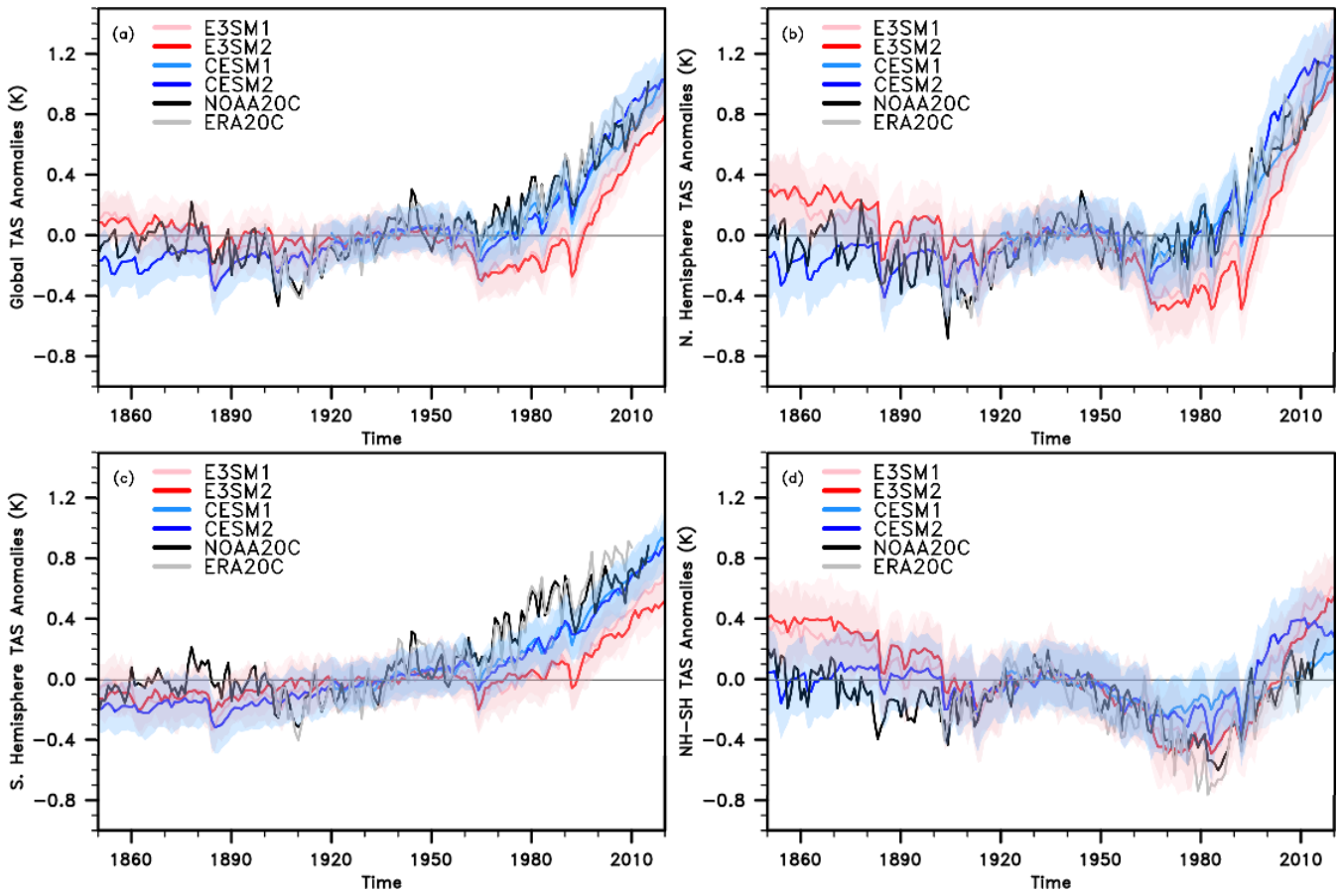

Figure S5: Evolution of mean near surface air temperature anomalies (K) from 1850 to 2015 for E3SM1/2 and CESM1/2 for (a) the globe, (b) NH, (c) SH, (d) NH-SH. Observation-based estimates from NOAA20C (black) and ERA20C (grey) are indicated. A base period of 1920-50 is used and its values for each region are indicated in parentheses.

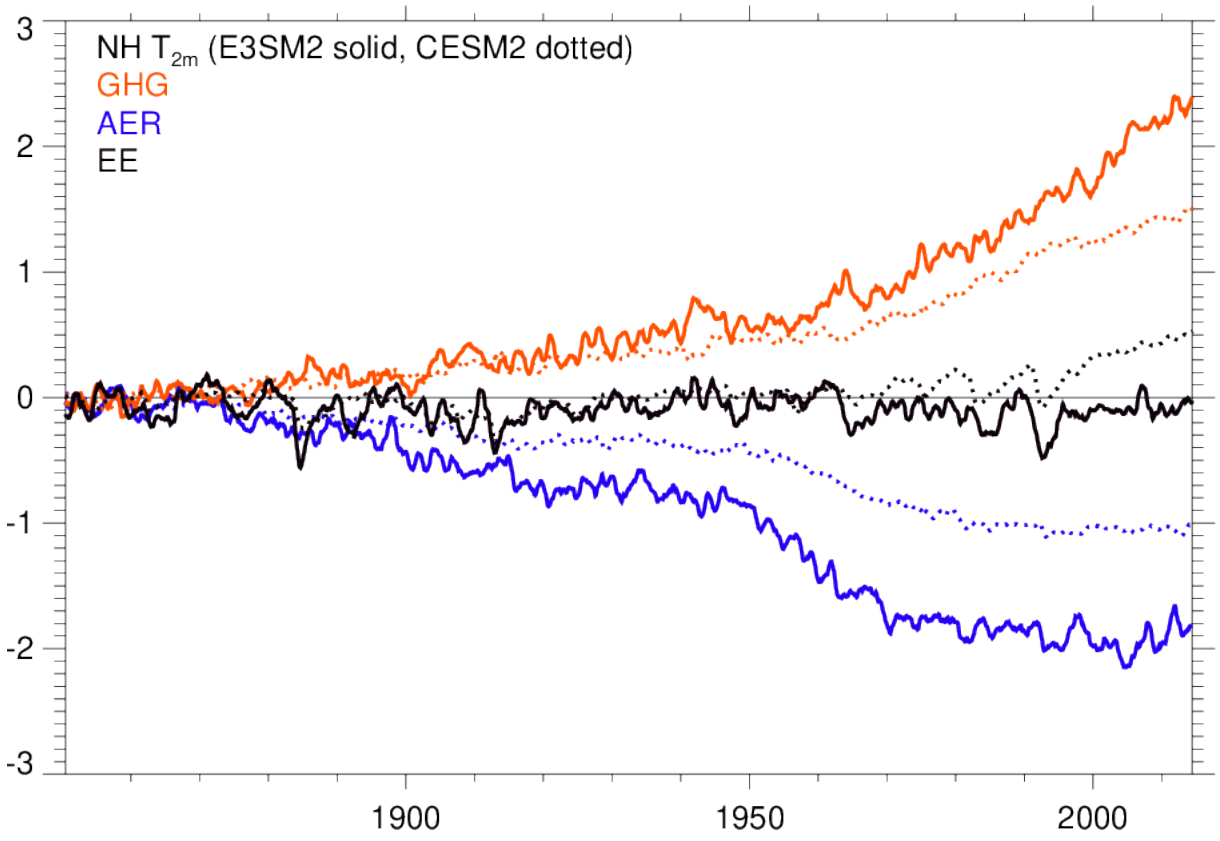

Figure S6: Evolution of NH near-surface air temperature for E3SM2 (solid) and CESM2 (dotted) single-forcing simulations where variability has been included in greenhouse gases (GHG, red), anthropogenic aerosols (AER, blue), and all other forcings (EE, black).

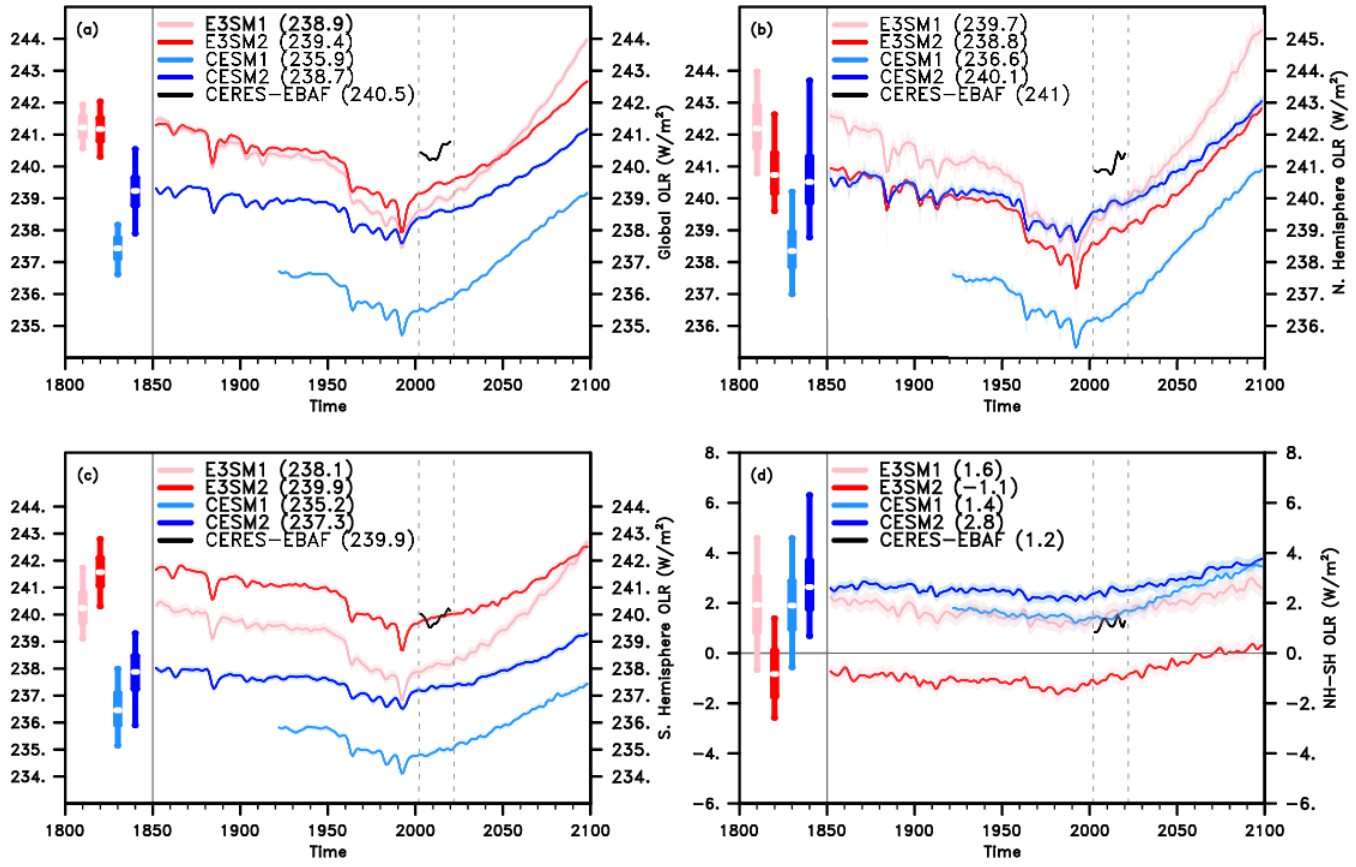

Figure S7: Evolution of mean OLR fluxes (W m^{-2}) from 1850 to 2100 for E3SM1/2 and CESM1/2 for (a) the globe, (b) NH, (c) SH, (d) NH-SH. Observation-based estimates from CERES (black) are indicated. Values for each region during the CERES period are indicated in parentheses.

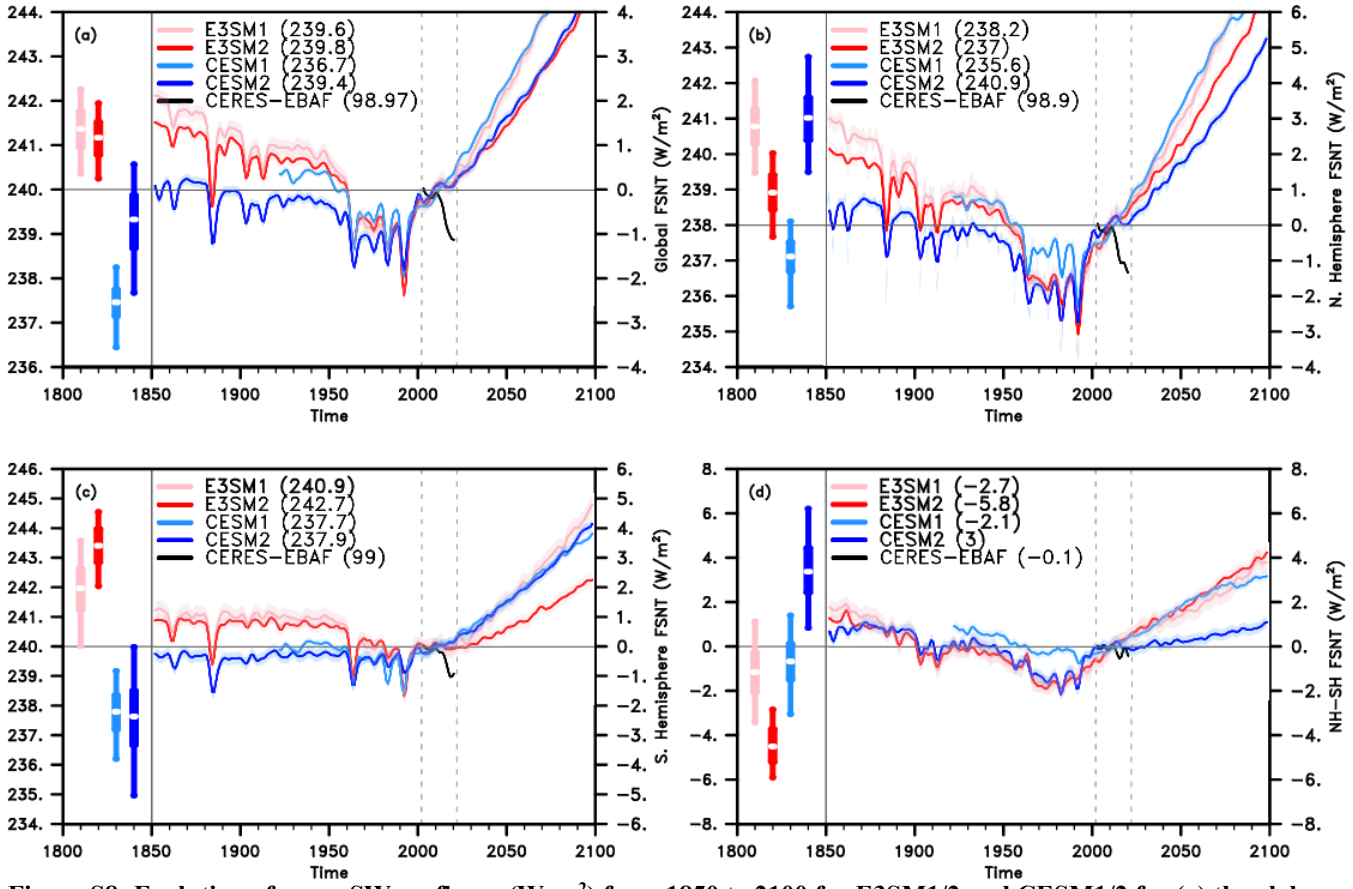

Figure S8: Evolution of mean SW_{TOA} fluxes (W m^{-2}) from 1850 to 2100 for E3SM1/2 and CESM1/2 for (a) the globe, (b) NH, (c) SH, (d) NH-SH. Observation-based estimates from CERES (black) are indicated. Values for each region during the CERES period are indicated in parentheses.