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SUPPLEMENTARY INFORMATION
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Distinct energy budgets for anthropogenic and natural changes during global warming hiatus

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Supplementary Table 1. List of pre-industrial control simulations used in this study. A single member (r1i1p1) is used for each model. The estimates of the forced climate feedback coefficient λ are from Forster *et al.*[36] based on abrupt CO_2 quadrupling experiments.

Model	Length [years]	λ [W m^{-2} K^{-1}]
ACCESS1-0	500	0.78
ACCESS1-3	500	
BNU-ESM	559	
CCSM4	500	1.23
CNRM-CM5	850	1.14
CSIRO-Mk3-6-0	500	0.63
CanESM2	996	1.04
FGOALS-s2	501	0.92
GFDL-ESM2G	500	1.29
GFDL-ESM2M	500	1.38
HadGEM2-ES	575	0.64
IPSL-CM5A-LR	1000	0.75
IPSL-CM5A-MR	300	
IPSL-CM5B-LR	300	1.02
MIROC-ESM	630	0.91
MIROC5	670	1.52
MPI-ESM-LR	1000	1.13
MPI-ESM-P	1156	1.25
MRI-CGCM3	500	1.25
NorESM1-M	501	1.11
bcc-csm1-1	500	1.14
inmcm4	500	1.43

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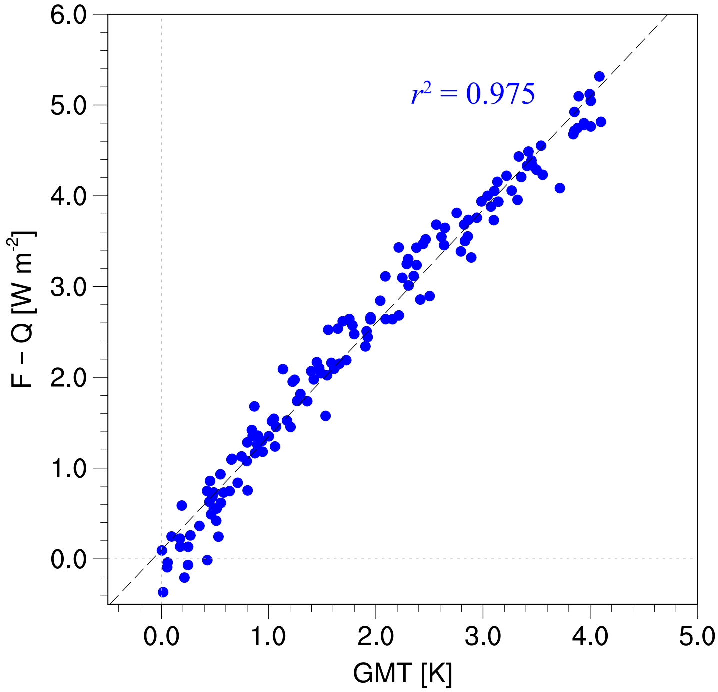
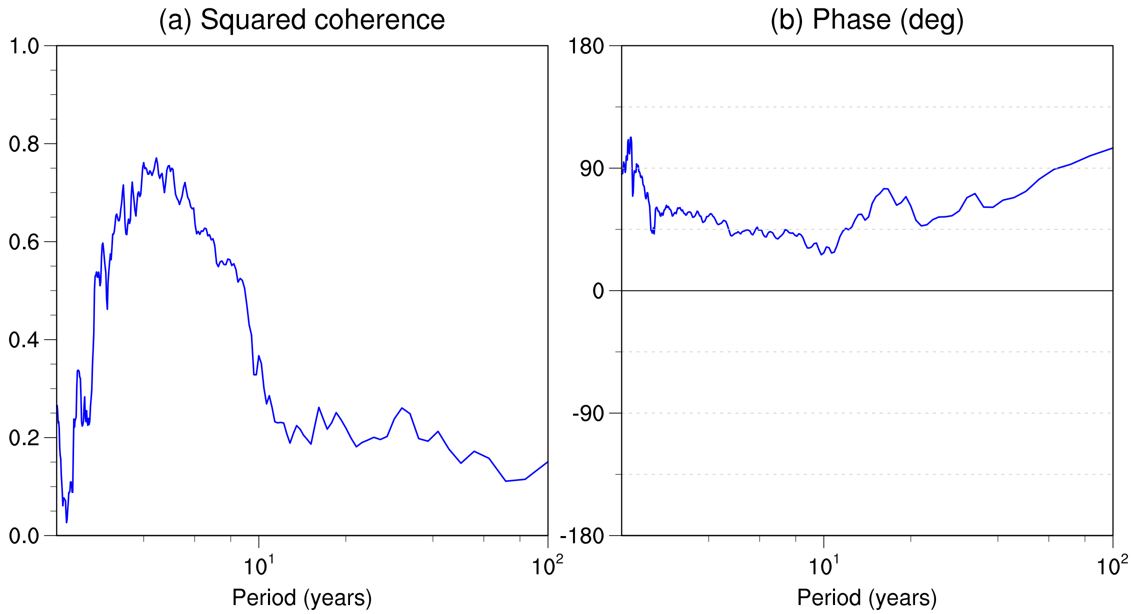


Supplementary Figure 1. Relationship between annual-mean GMT and TOA radiation changes in CCSM4 due to 1%/year CO_2 increase. Scatter diagram between GMT and the climate feedback (the difference between radiative forcing and net TOA radiation) for 140 years. Radiative forcing *F* is estimated by scaling the model's radiative forcing due to CO_2 doubling (3.57 W m^{-2}). Note the tight correlation ($r = 0.99$).



Supplementary Figure 2. A coherence analysis between GMT as input and net outgoing TOA radiation (–*Q*) as output. Based on CCSM4 pre-industrial control simulation. (a) Squared coherence and (b) phase. Note the phase of 45º-90º from decadal to >50-year periods, while the coherence decreases.

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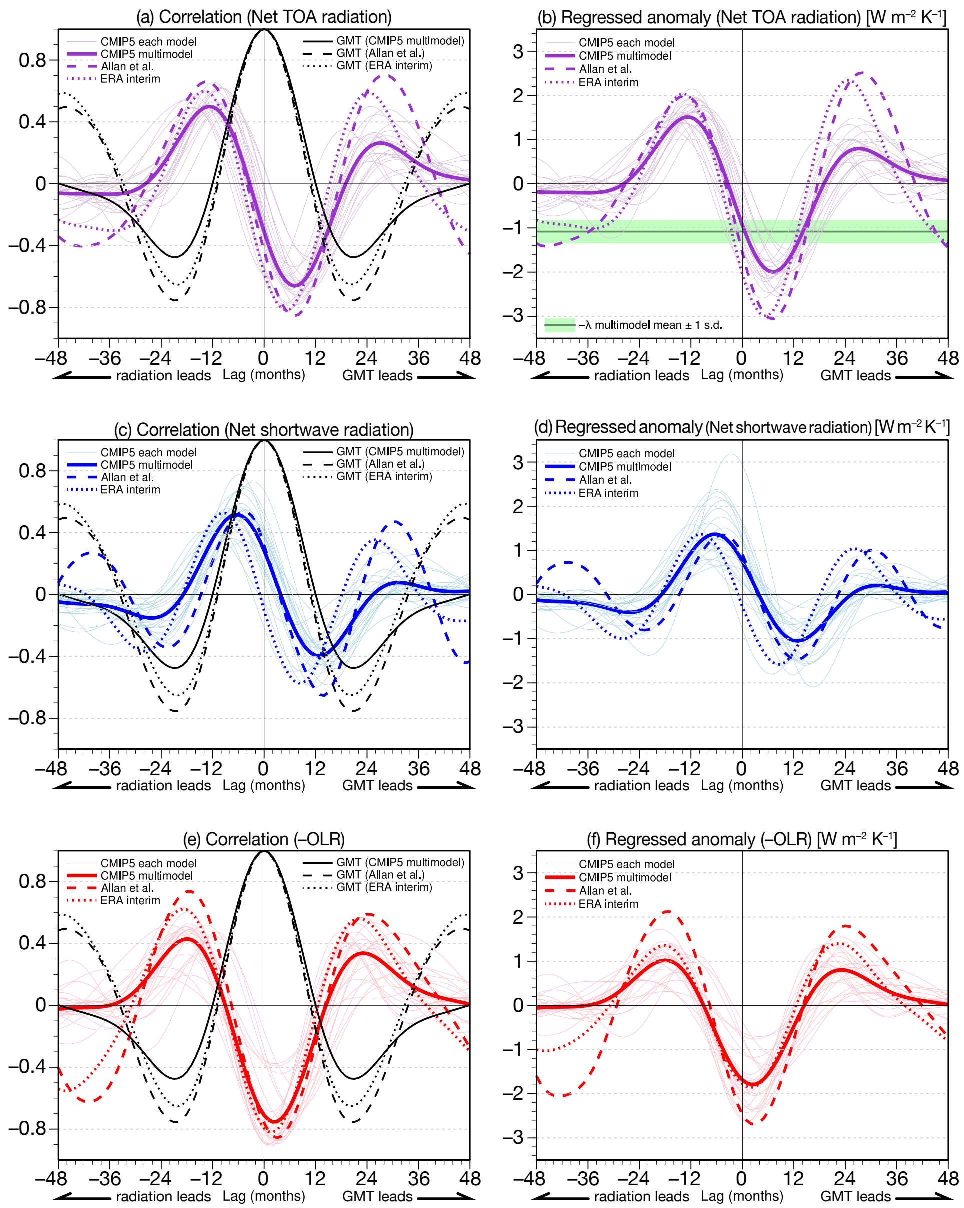
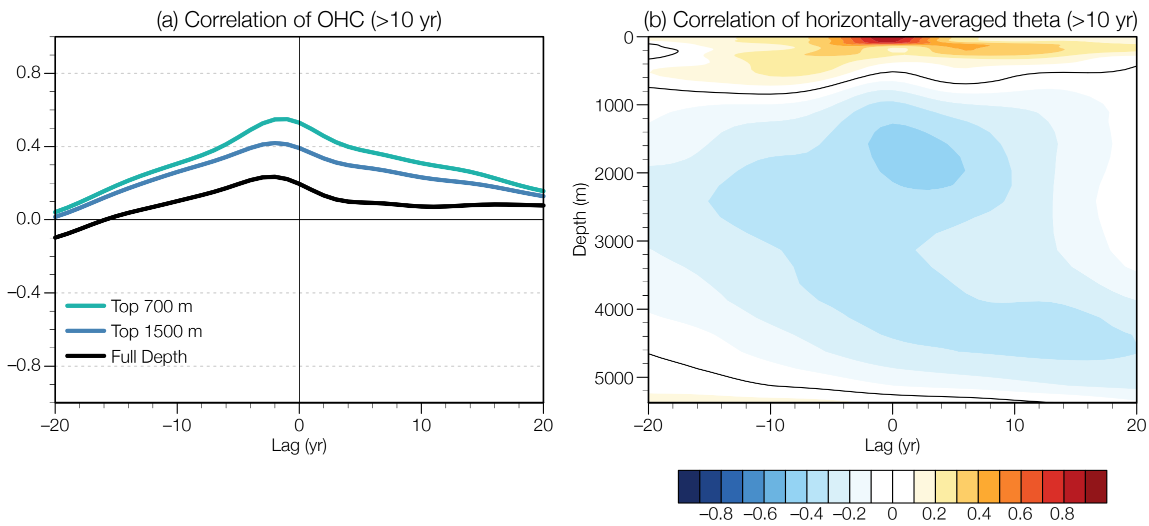


Supplementary Figure 3. Relationship between GMT and TOA radiation in interannual variability. (**left**) Lagged correlation and (**right**) regression of (**a,b**) net, (**c,d**) shortwave and (**e,f**) longwave TOA radiation against GMT based on 2-10-year band-pass filtered pre-industrial simulations of CMIP5 (thin curves: individual models; thick solid curves: multi-model mean), satellite-based reconstruction[22] with HadCRUT4 (long-dashed) and ERA-Interim (short-dashed). Also shown with black curves in (**a,c,e**) are autocorrelations of GMT for CMIP5 multi-model ensemble mean, HadCRUT4, and ERA-Interim. Multi-model mean and inter-model standard deviation of the forced climate feedback parameter λ is superimposed in (**b**).



Supplementary Figure 4. Vertical structure of ocean heat anomalies for natural decadal GMT variability. Lagged correlation with GMT: (**a**) OHC for top 700 m (green), top 1500 m (blue) and full depth (black) and (**b**) horizontally-averaged temperature, based on 10-year low-pass filtered data of CCSM4 pre-industrial control run. The decreasing correlation from negative to positive lags in (**a**) is consistent with the negative correlation of net TOA radiation at lag 0 in Fig. 1c. The correlation is highest for the top 700 m (**b**). Adiabatic vertical redistribution of ocean temperature anomalies can occur in response to wind changes even though the integrated OHC over the world ocean remains unchanged.