SUPPLEMENTARY TABLES AND FIGURES:

Sup. Table 1: Local averages in the regions where the centers of action of the climate indices are defined (Dotted black boxes in Sup. Fig 2). Averages are calculated for the heat flux corrections, and longterm net surface means (both in W/m^2).

	ENSO	PDO	AMO	NAO
Heat flux correction	2.5	11.0	7.9	-1.9
Net surface heat flux mean	53.7	-16.1	-23.1	-43.6

Sup. Table 2: Correlations among the different forcings for the whole millennium. Values exceeding the 95% confidence level according to a Students t test are highlighted in bold.

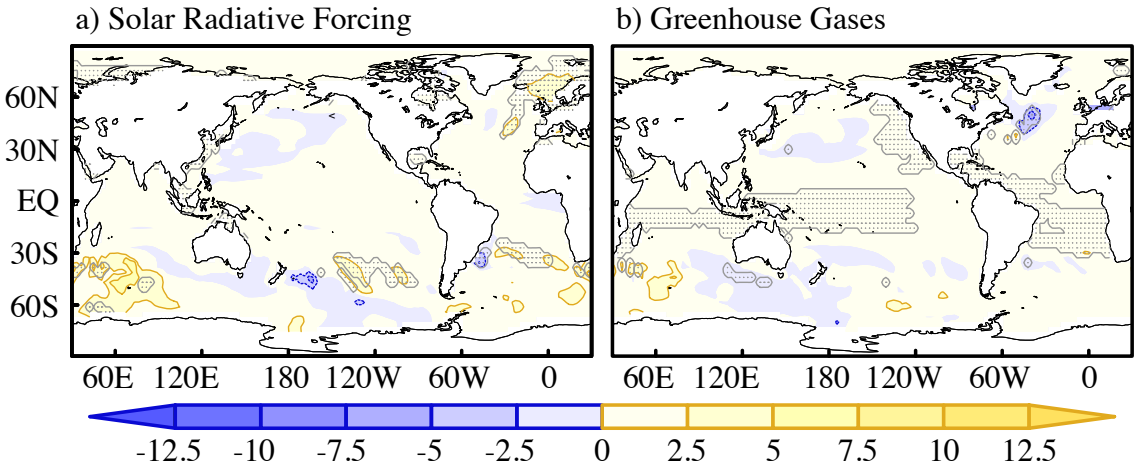
	Solar	Volcanic	GHGs
Solar	-	0.02	**0.55**
Volcanic	-	-	-0.03

Sup. Table 3: The same as in Sup. Table 2 but for the preindustrial period.

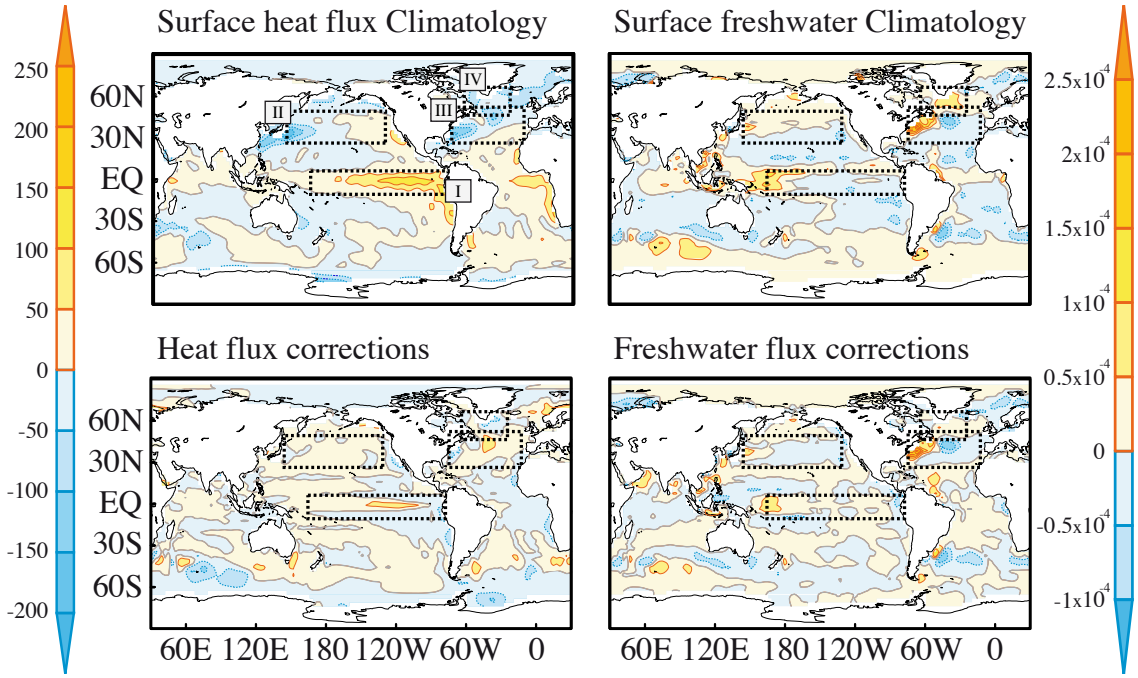
	Solar	Volcanic	GHGs
Solar	-	0.03	0.21
Volcanic	-	-	0.01

Sup. Table 4: Correlations among the total radiative forcing and the climate indices in the whole FOR2 simulation. Values exceeding the 95% confidence level according to the test in Fig. 7 are highlighted in bold.

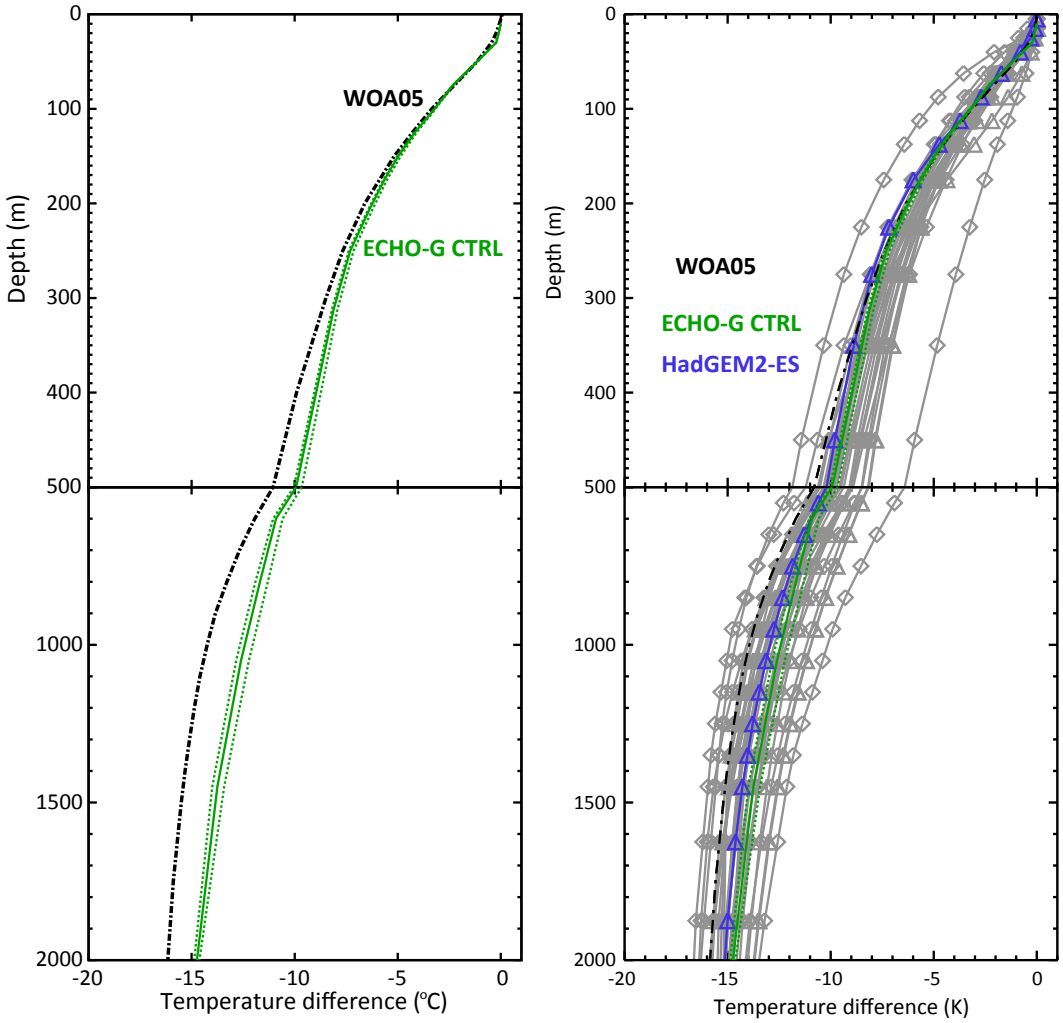
	ENSO	PDO	AMO	NAO
Total radiative forcing	0.03	0.01	0.01	**0.17**



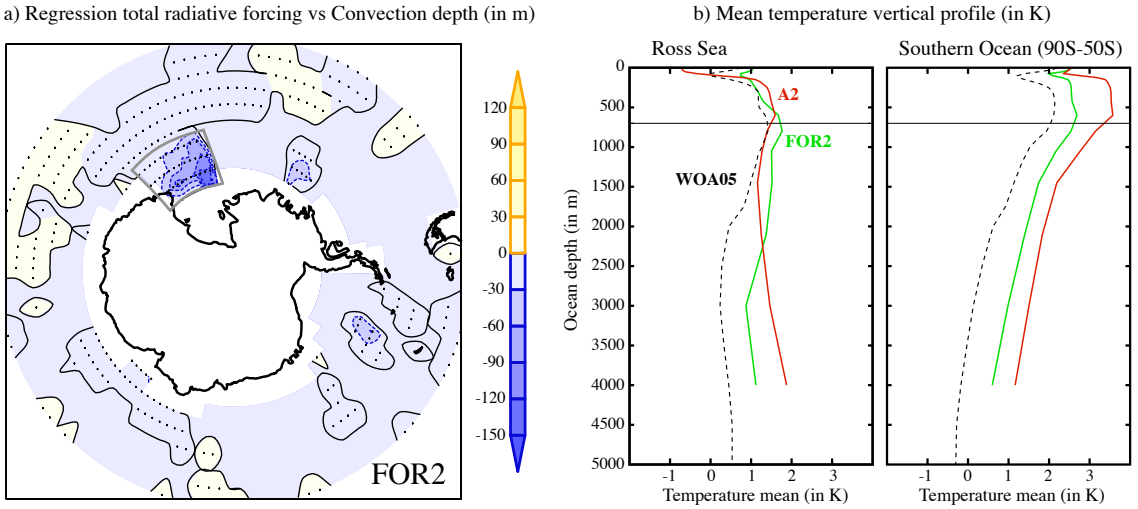
Sup. Fig. 1: Regression patterns in FOR2 between the OHC700 anomalies (in 10^8J/m^2) and the standardised series of the solar irradiance (top) and the equivalent forcing of GHGs (bottom) during the preindustrial period (1000-1850). Significance is addressed as in Fig. 5.



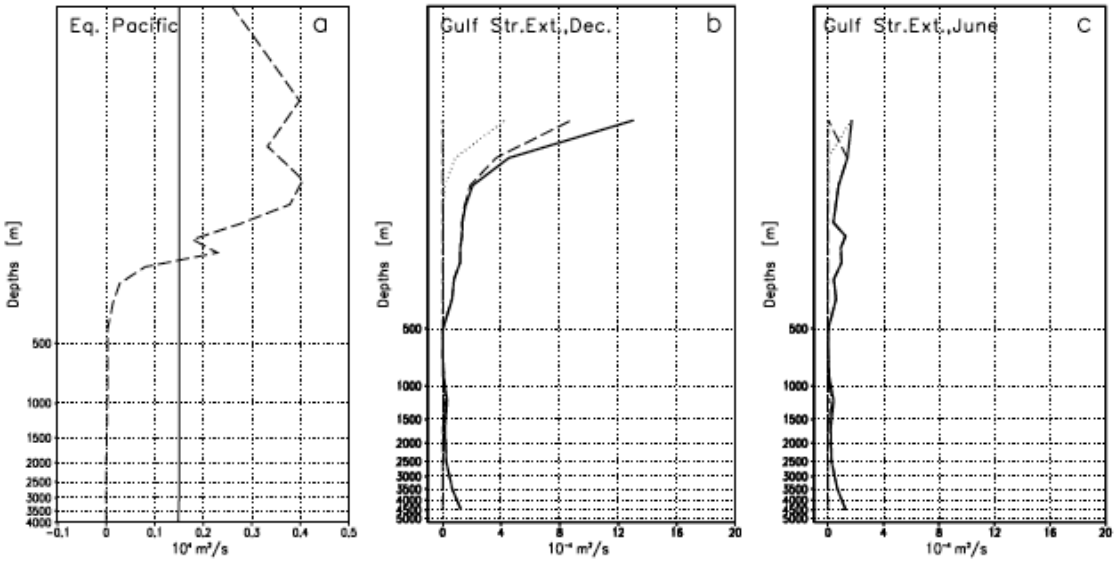
Sup. Fig. 2: *Top*: Spatial patterns of the long-term means in surface net heat (left; in W/m^2) and freshwater fluxes (right; in kg/m^2·s) in CTRL. *Bottom*: Annual heat (left; in W/m^2) and freshwater (right; in kg/m^2·s) flux corrections applied to all simulations. Dotted boxes enclose the regions where the regional OHC averages are calculated.



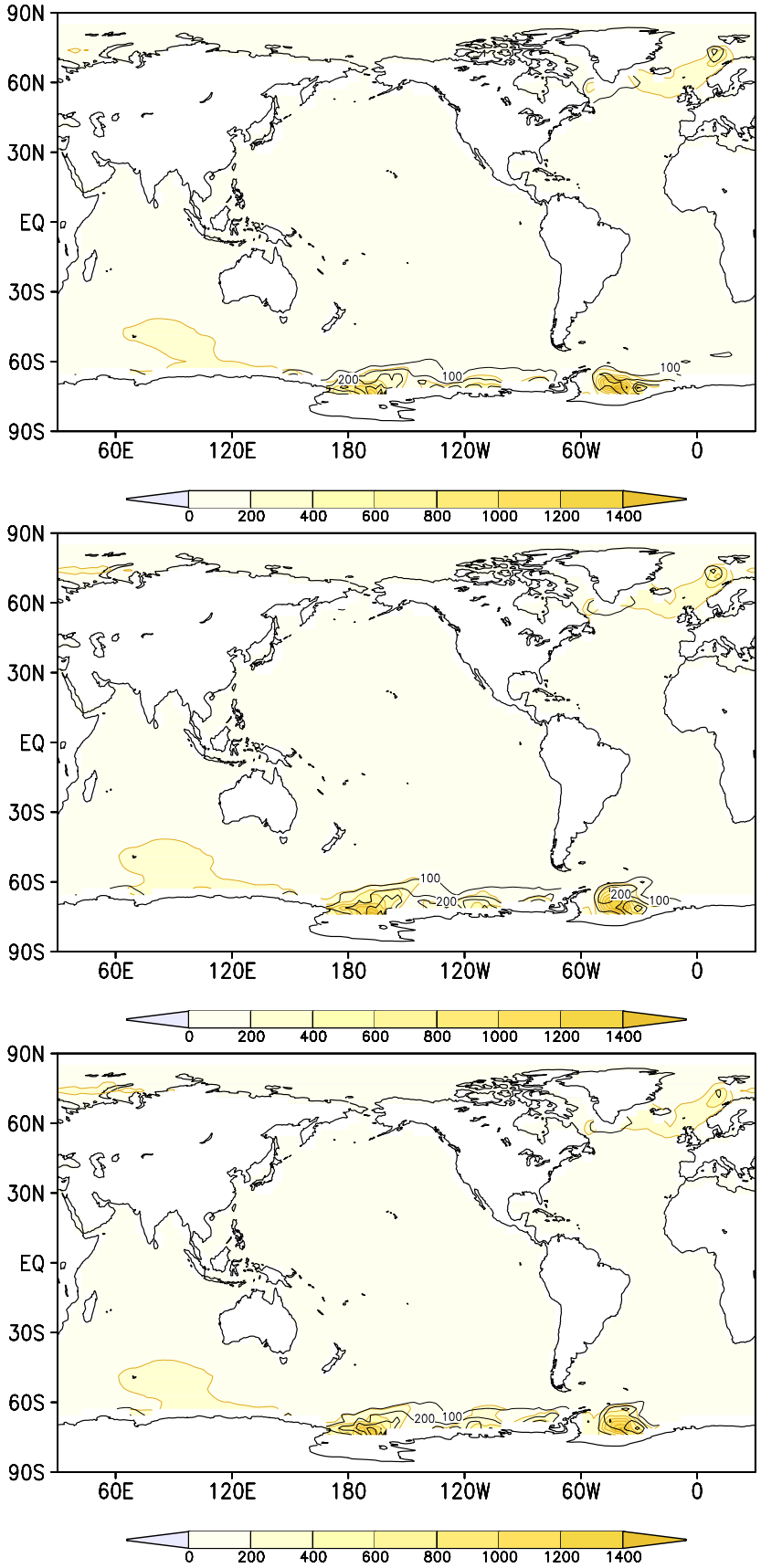
Sup. Fig. 3: *On the left:* Globally averaged temperature profiles for CTRL (green lines) and for observations from WOA05 (dashed black line; Locarnini et al., 2006). Temperature profiles in CTRL are calculated for the mean climatology in three different periods: first for the whole simulation (solid green line), secondly for the first 20 years (right green dotted line) and finally for the last 20 years of the simulation (left green dotted line). *On the right:* Superposition of the previous plot on top of Figure 2a from Kuhlbrodt and Gregory (2012).



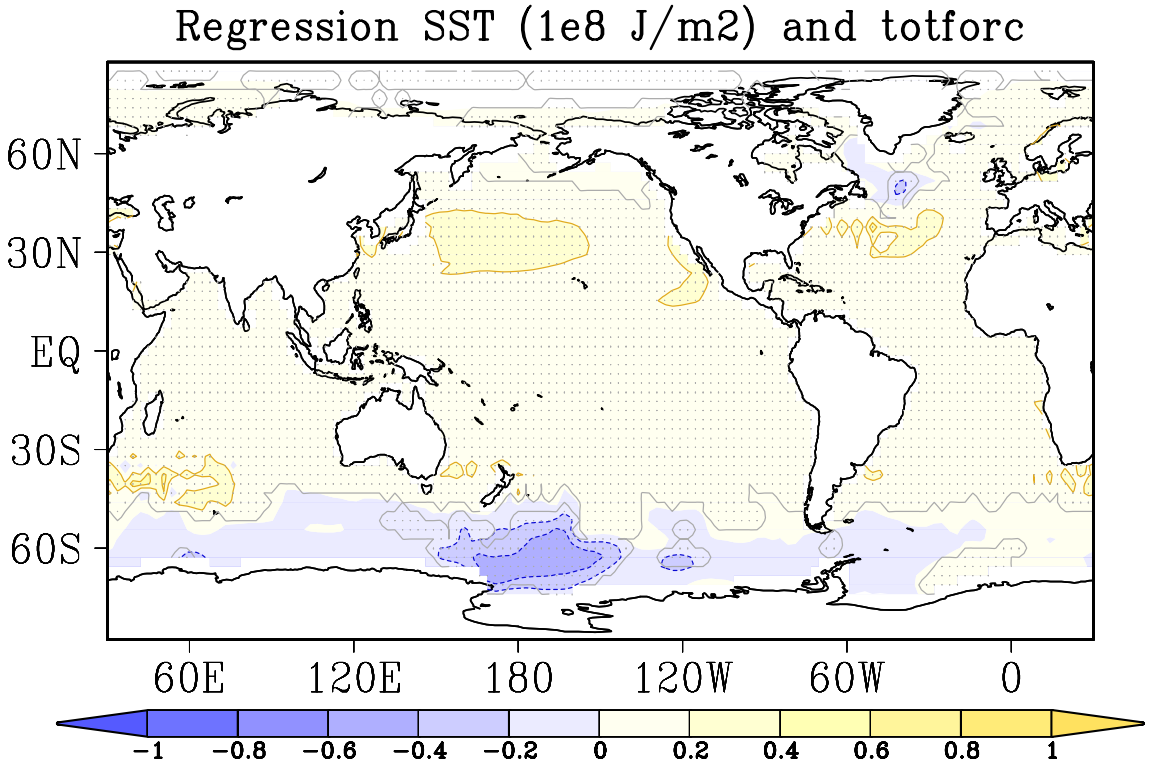
Sup. Fig. 4: a) Regression patterns between the standardised total radiative forcing and the maximum convection depth anomalies (in m) in the whole simulation FOR2 (top right). b) Locally averaged climatological temperature profiles in the Ross Sea (left) and the Southern Ocean (right) for FOR2, A2 and the WOA05 (Locarnini et al., 2006). For the Ross Sea the average is performed over the grey area highlighted on the regression pattern. The Southern ocean is averaged from 90°S to 60°S. The thin horizontal line in the vertical profiles separates the upper 700 m from the deeper levels.



Sup. Fig. 5: (a) Annual-mean vertical profiles of shear-dependent (dashed curve) and harmonic (full curve) effective horizontal diffusivity coefficients in the equatorial Pacific. (b) Vertical profiles of total (full curve), Richardson-no.-dependent (dashed curve), mixed-layer (dotted curve), and background (short-long-dashed curve) vertical effective eddy diffusivity coefficients in the Gulf Stream Extension in December. (c) Same as (b) in June. Units are $10^4 m^2 s^1$. Figure from Legutke and Maier-Reimer (1999).



Sup. Fig. 6: *Top:* Climatological long-term mean (shaded) and standard deviation (in contours) values of the maximum convection depth (in m) in CTRL (top), FOR1 (middle) and FOR2 (bottom). Contour levels correspond to 100 m.



Sup. Fig. 7: Regression patterns in FOR2 between the SST anomalies (in K) and the standardised series of the total radiative forcing. Significance is addressed as in Fig. 5.

References

Kuhlbrodt T, Gregory JM (2012) Ocean heat uptake and its consequences for the magnitude of sea level rise and climate change. Geophysical Research Letters 39: L18,608

Legutke S, Maier-Reimer E (1999) Climatology of the HOPE-G Global Ocean General Circulation Model. Technical Report 21, DKRZ, Hamburg, Germany

Locarnini R, Mishonov A, Antonov J, Boyer T, Garcia H, Levitus S, et al. (2006) World ocean atlas 2005 volume 1: Temperature. NOAA, Silver Spring, Md., 182 pp.