

# Supporting Information for "Global marine ecosystem response to a strong AMOC weakening under low and high future emission scenarios"

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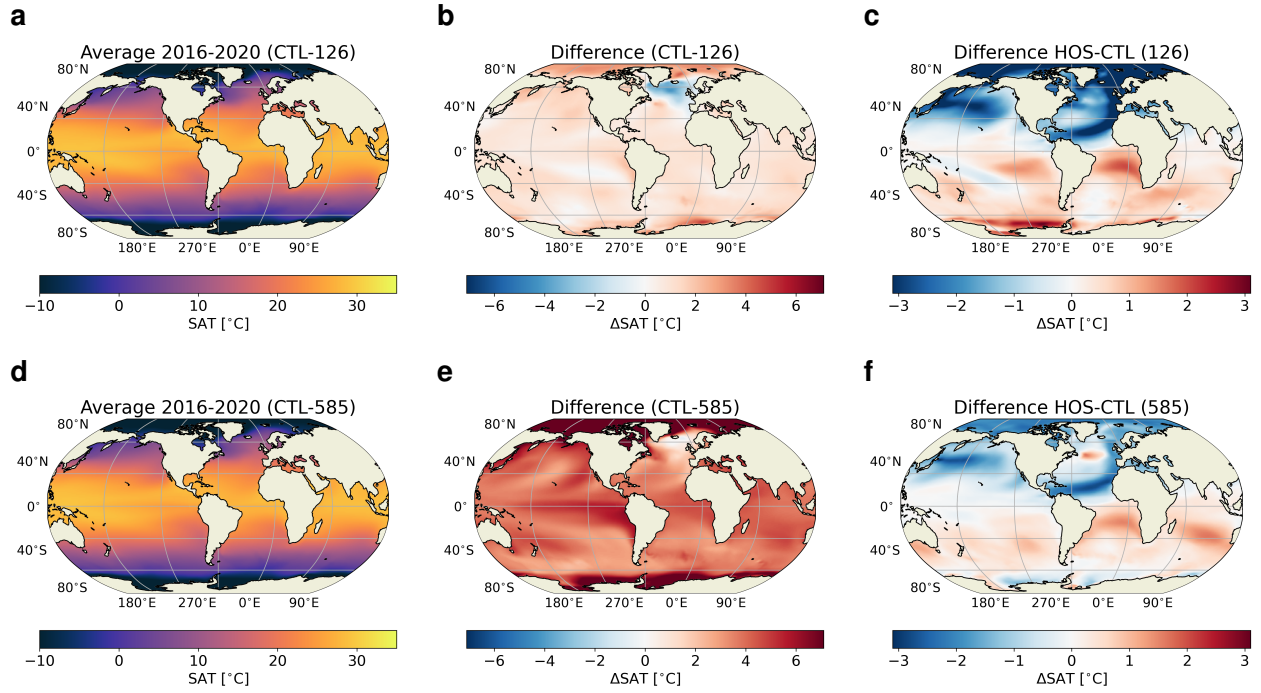
1. Figures S1 to S23

2. Tables S1

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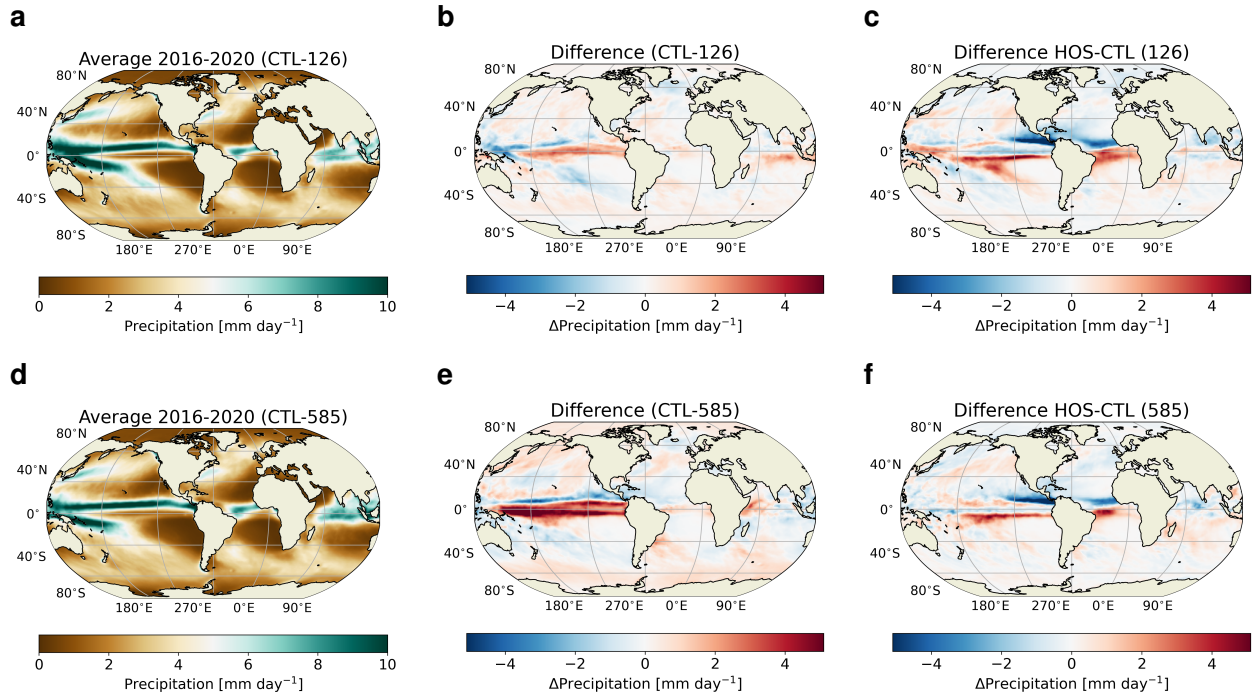
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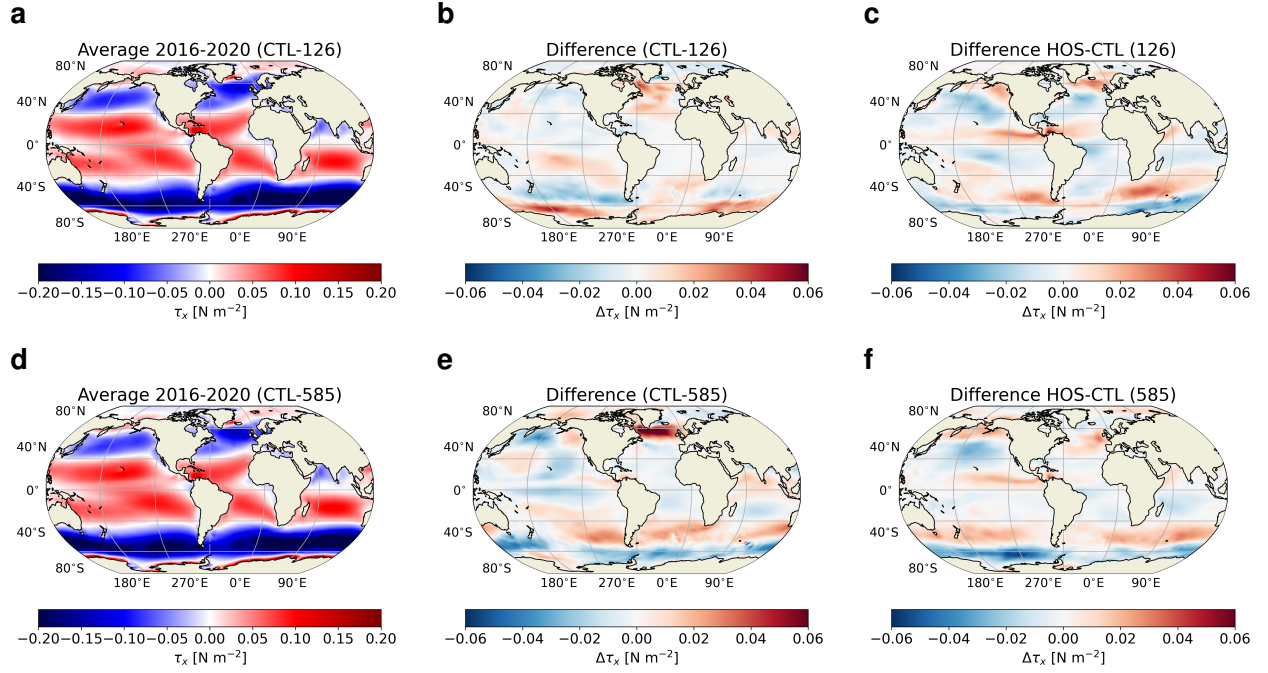


**Figure S1.** Surface Air Temperature (SAT) in °C for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

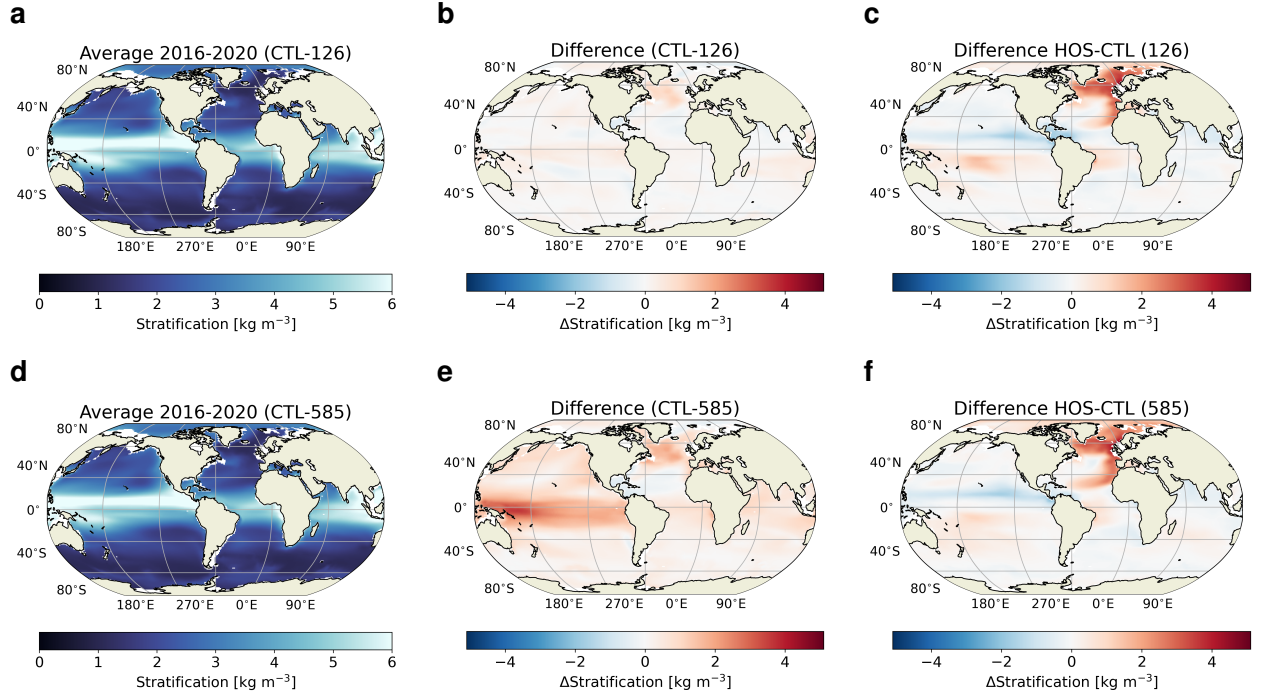




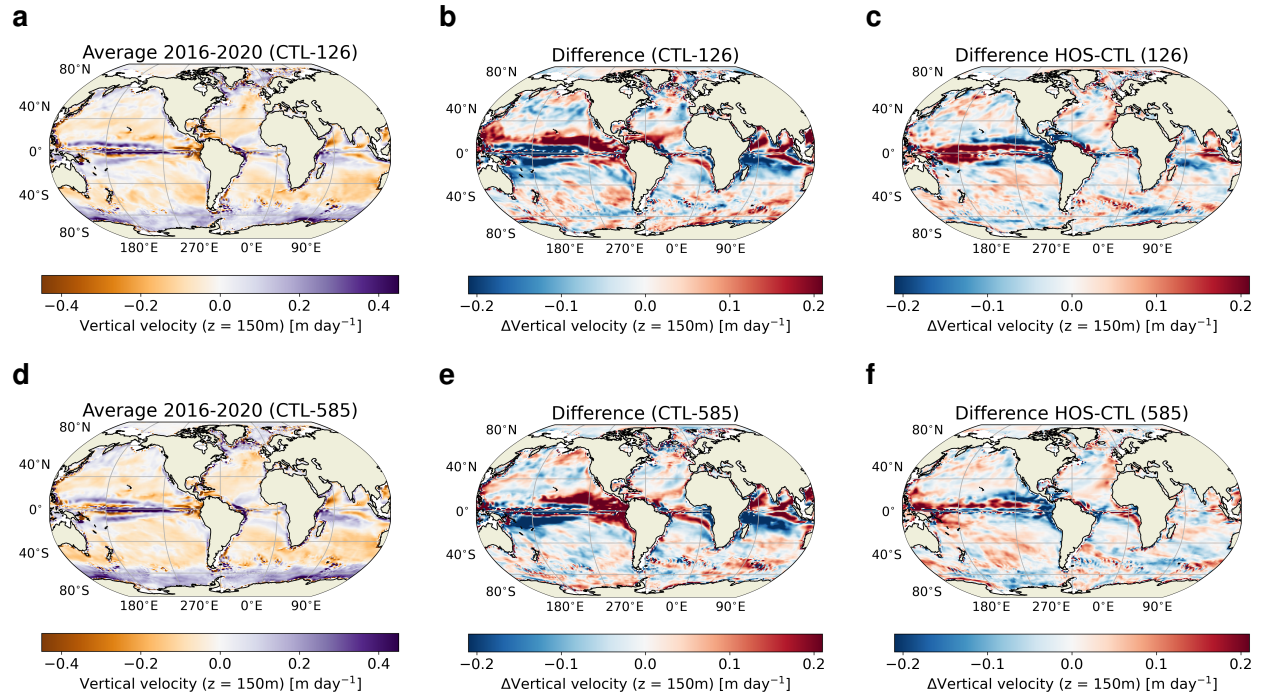
**Figure S2.** Precipitation in  $\text{mm day}^{-1}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



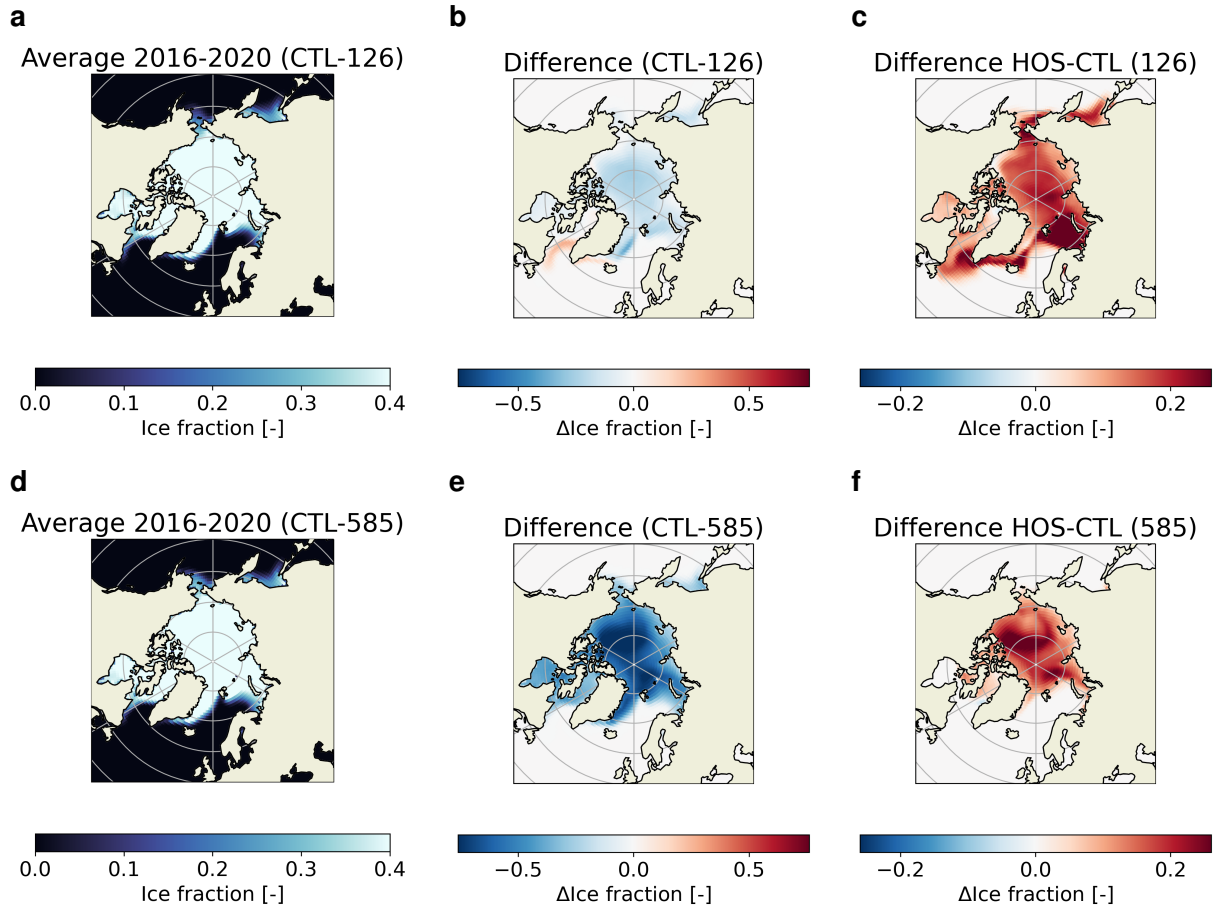
**Figure S3.** Zonal surface wind stress in  $\text{N m}^{-2}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



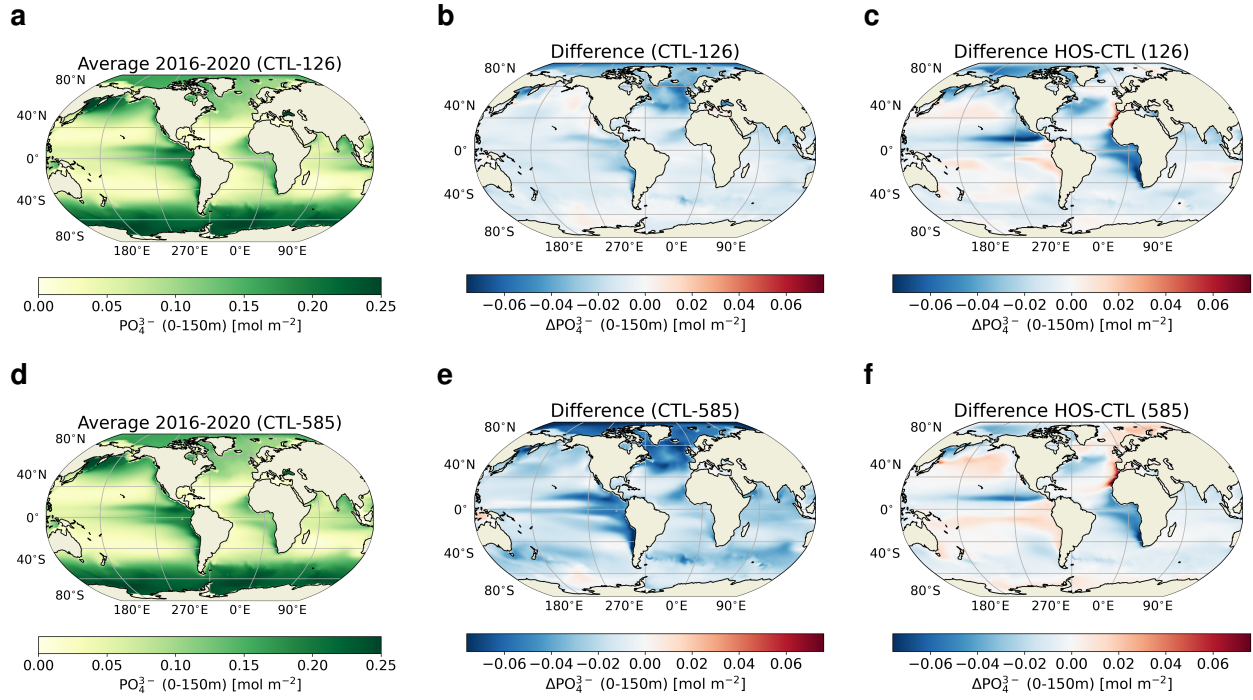
**Figure S4.** Stratification, defined as the density difference between 200 m depth and the surface, in  $\text{kg m}^{-3}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



**Figure S5.** Upwelling velocity at 150 m in  $\text{m day}^{-1}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

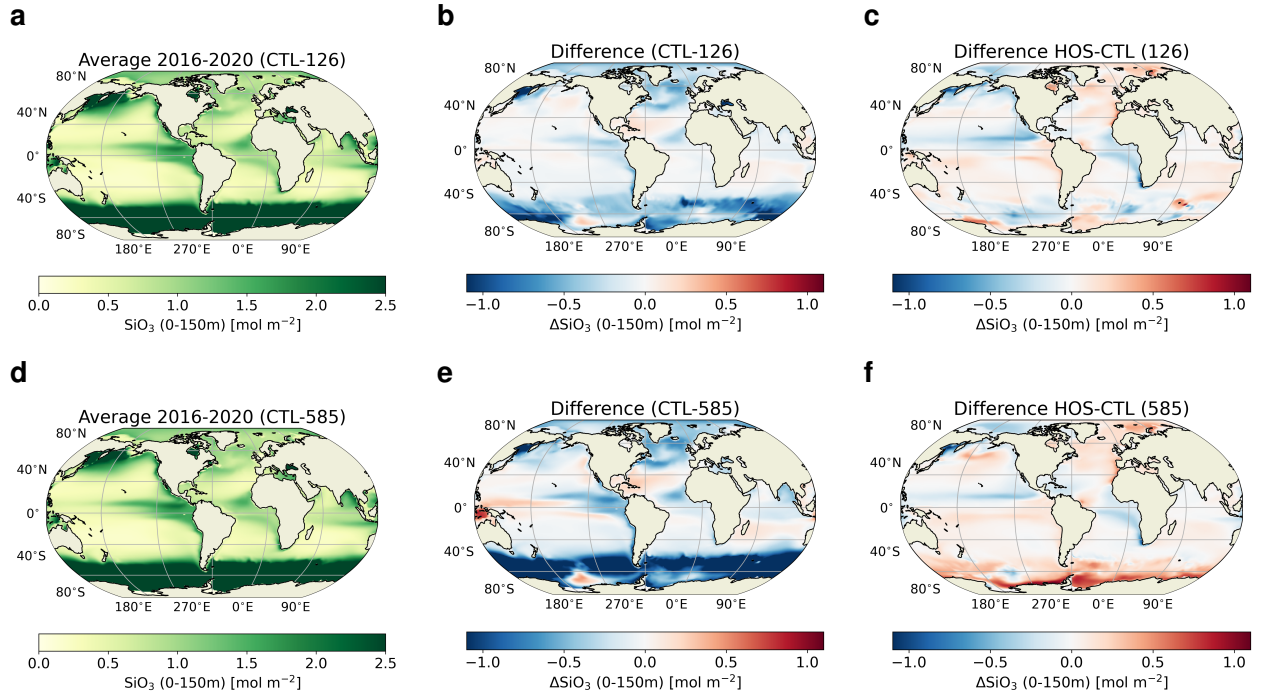


**Figure S6.** Arctic sea-ice fraction (unitless) for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

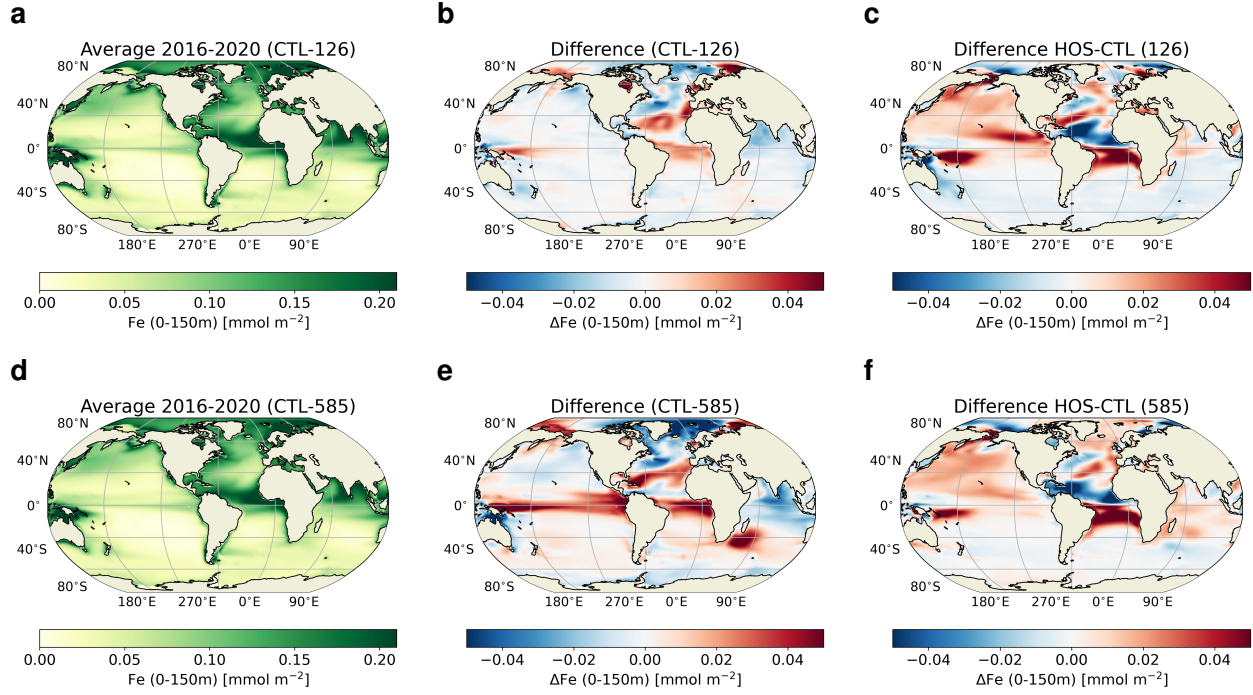


**Figure S7.** Phosphate ( $\text{PO}_4^{3-}$ ) concentrations integrated over the top 150 m in  $\text{mol m}^{-2}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



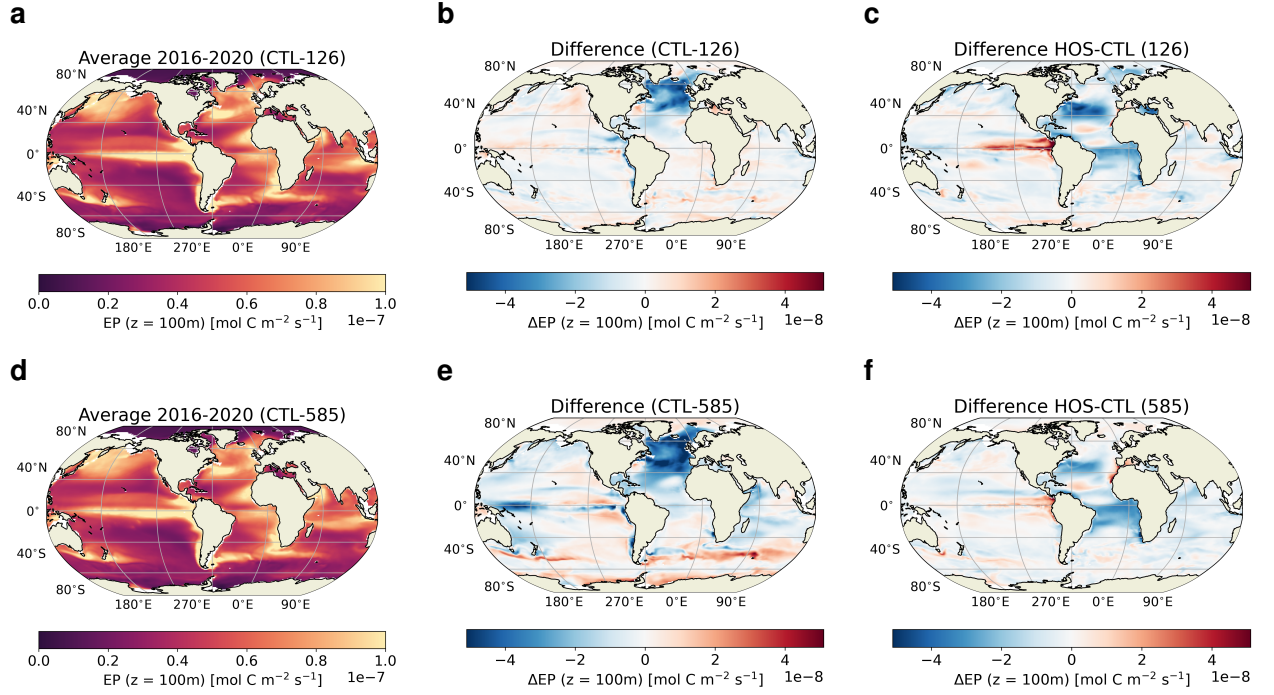


**Figure S8.** Silicate ( $\text{SiO}_3^{2-}$ ) concentrations integrated over the top 150 m in  $\text{mol m}^{-2}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

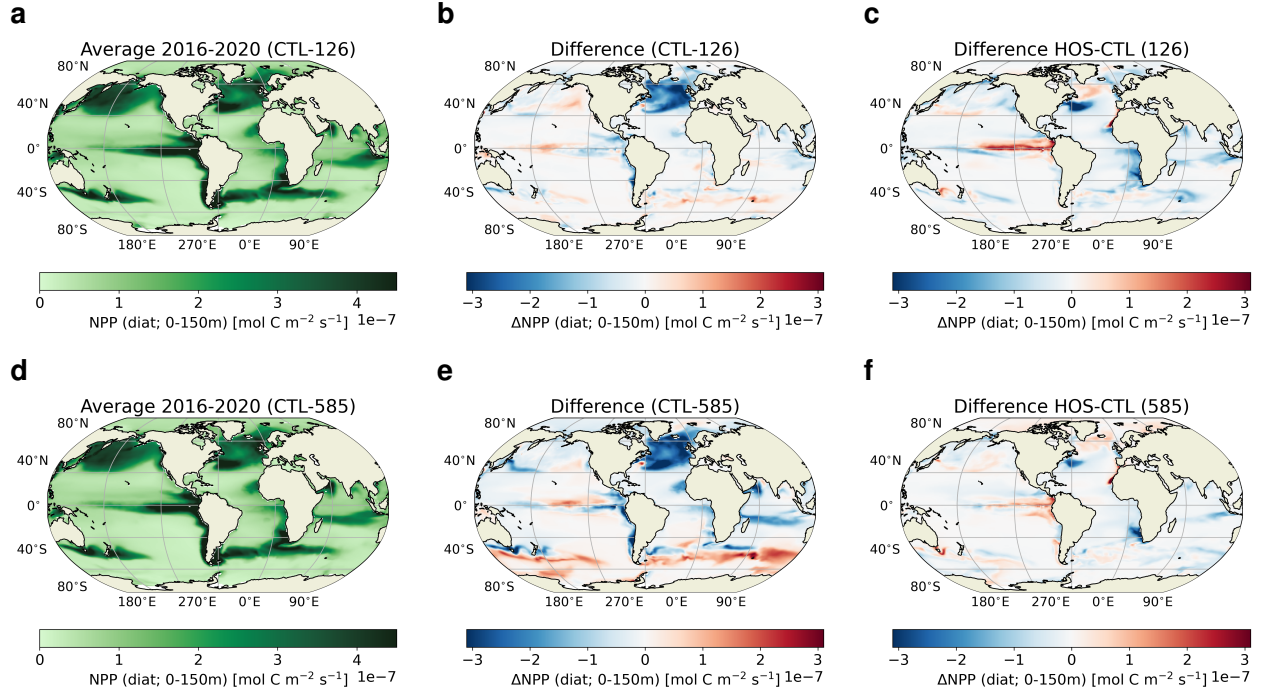


**Figure S9.** Iron (Fe) concentrations integrated over the top 150 m in  $\text{mmol m}^{-2}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

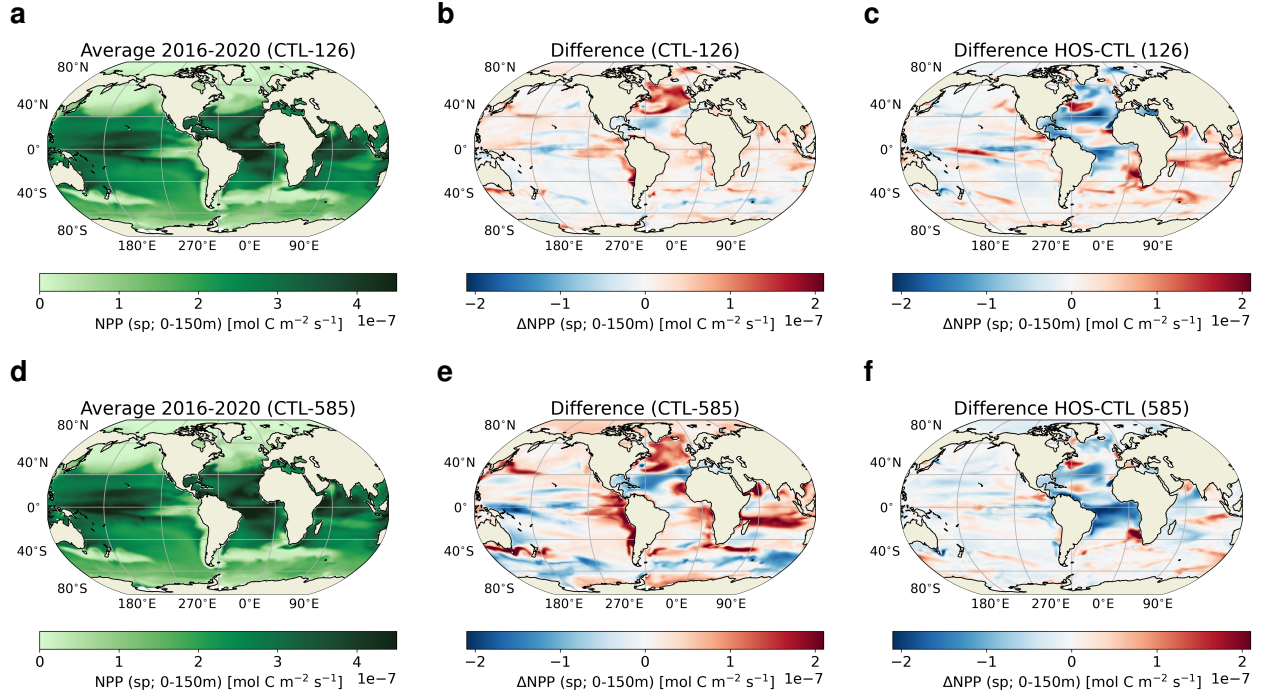




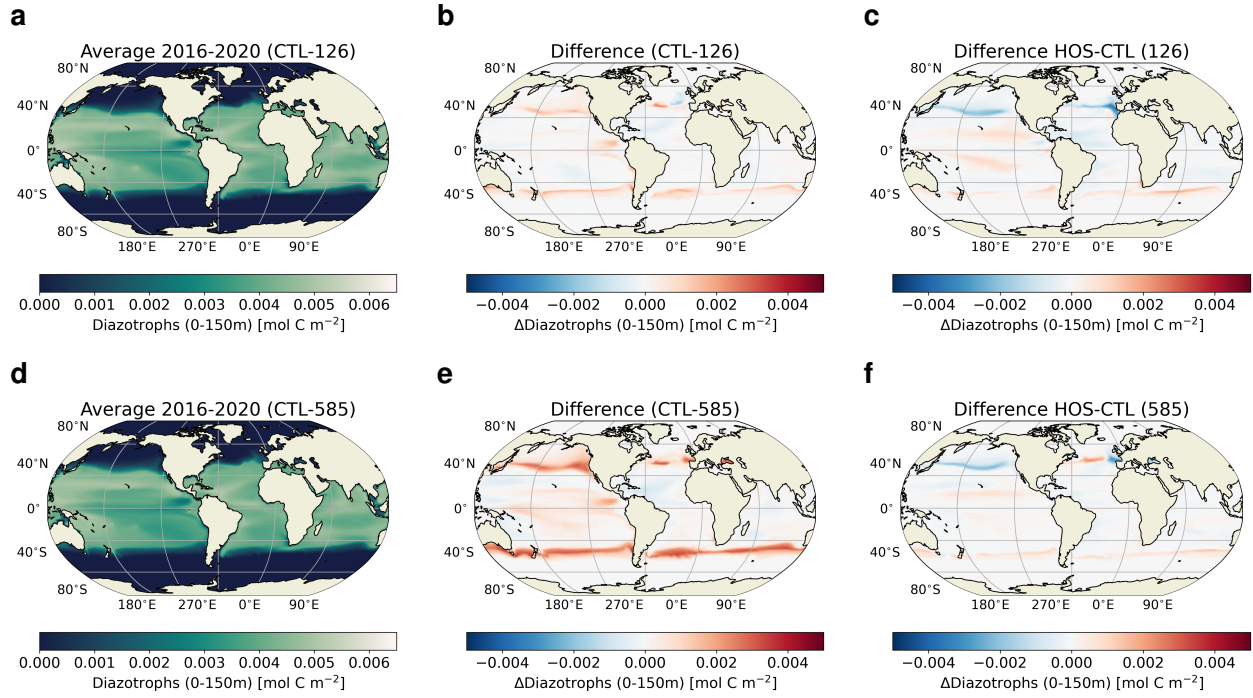
**Figure S10.** Export production at 100 m depth in  $\text{mol C m}^{-2} \text{s}^{-1}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



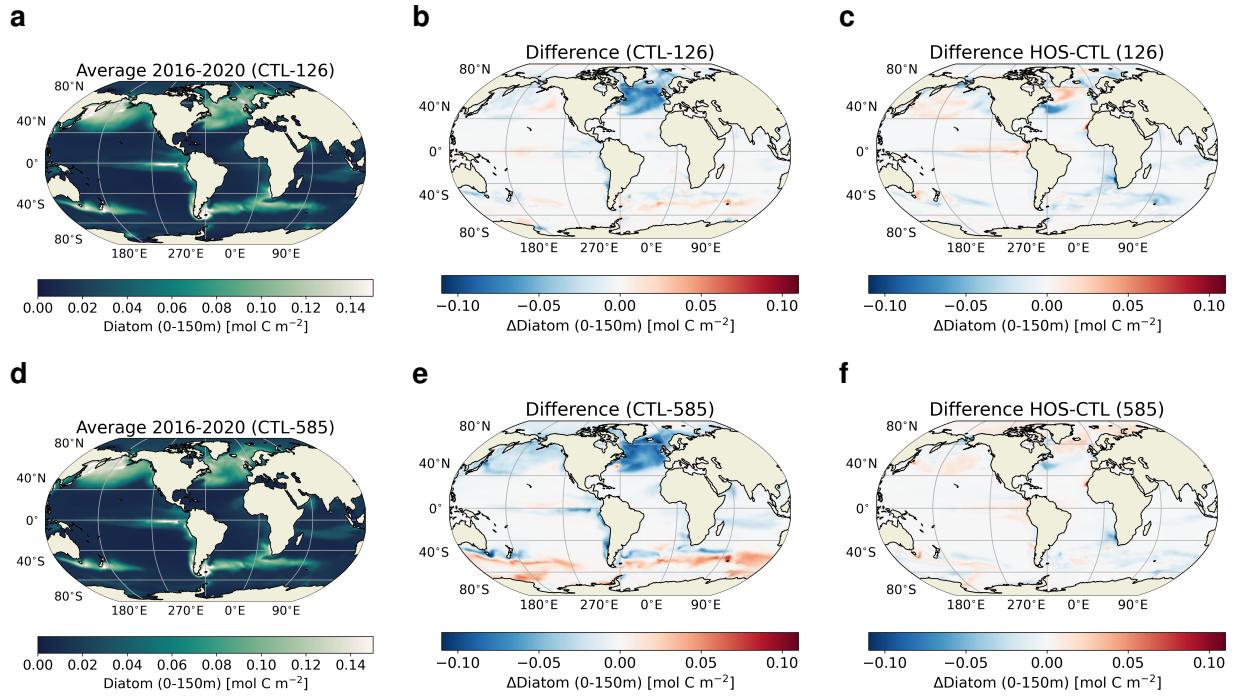
**Figure S11.** Net Primary Production of diatoms integrated over the top 150 m in  $\text{mol C m}^{-2} \text{s}^{-1}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



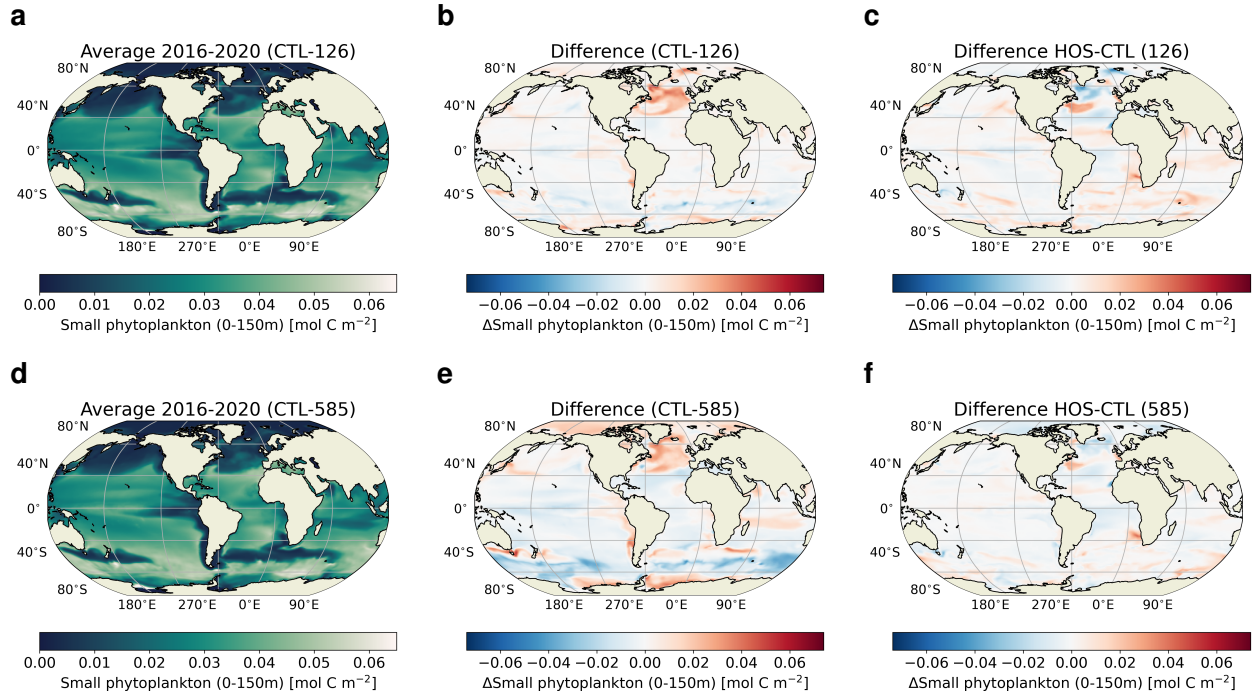
**Figure S12.** Net Primary Production of small phytoplankton integrated over the top 150 m in  $\text{mol C m}^{-2} \text{ s}^{-1}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



**Figure S13.** Diazotroph biomass integrated over the top 150 m in  $\text{mol C m}^{-2}$  for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

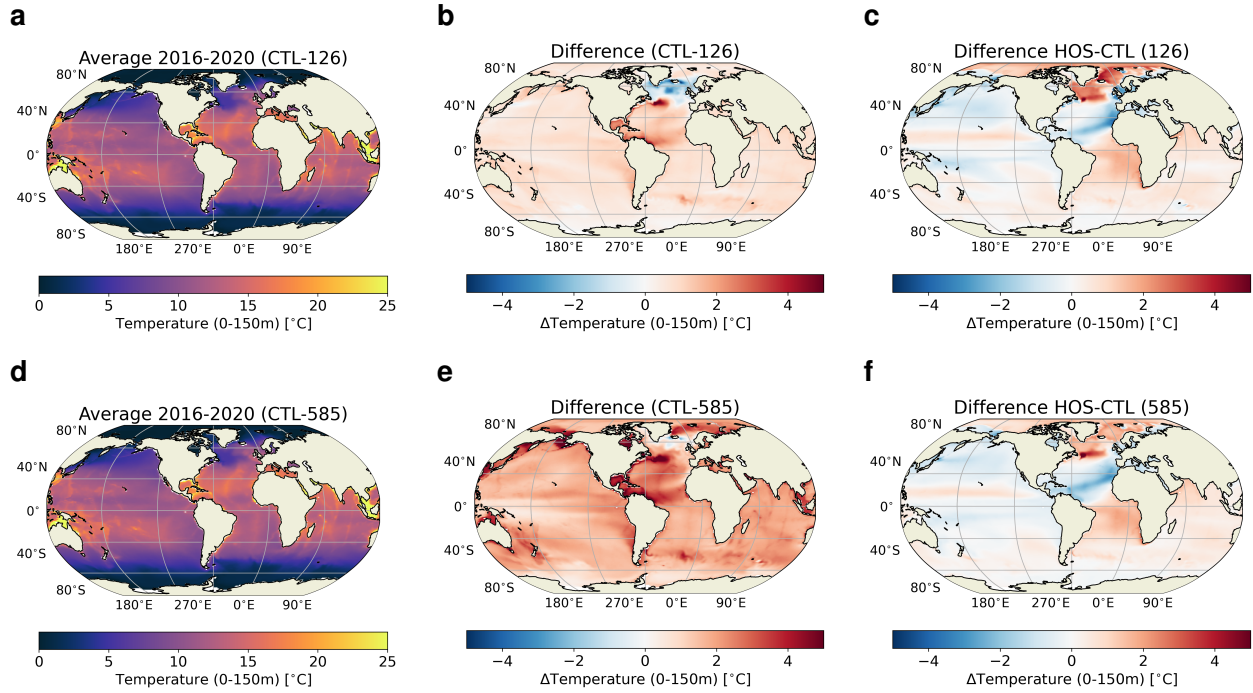


**Figure S14.** Diatom biomass integrated over the top 150 m in mol C m<sup>-2</sup> for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

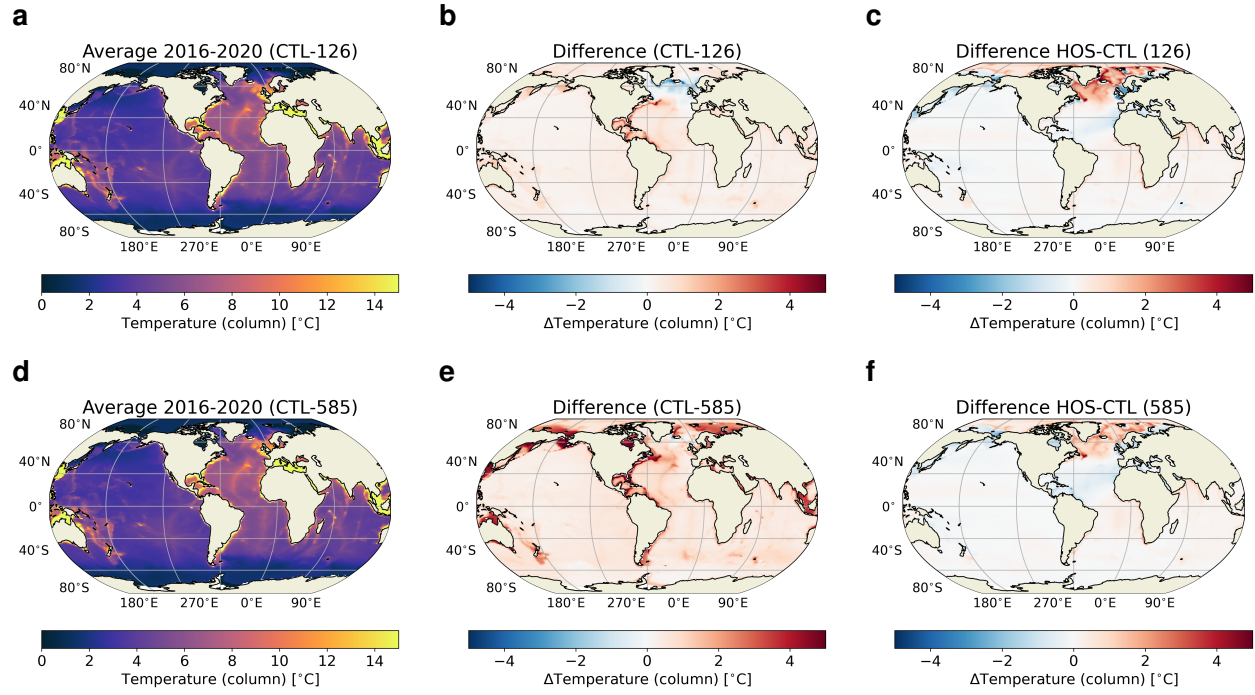


**Figure S15.** Small phytoplankton biomass integrated over the top 150 m in mol C m<sup>-2</sup> for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



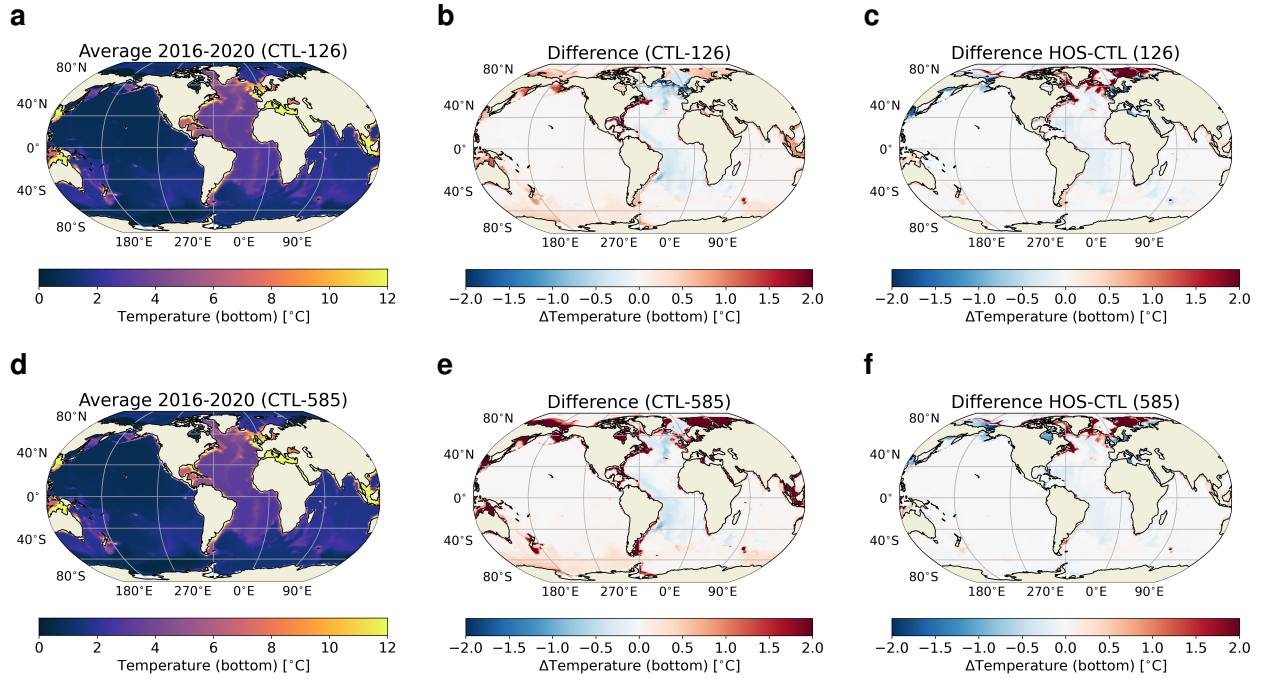


**Figure S16.** Temperature averaged over the top 150 m of the ocean in °C for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

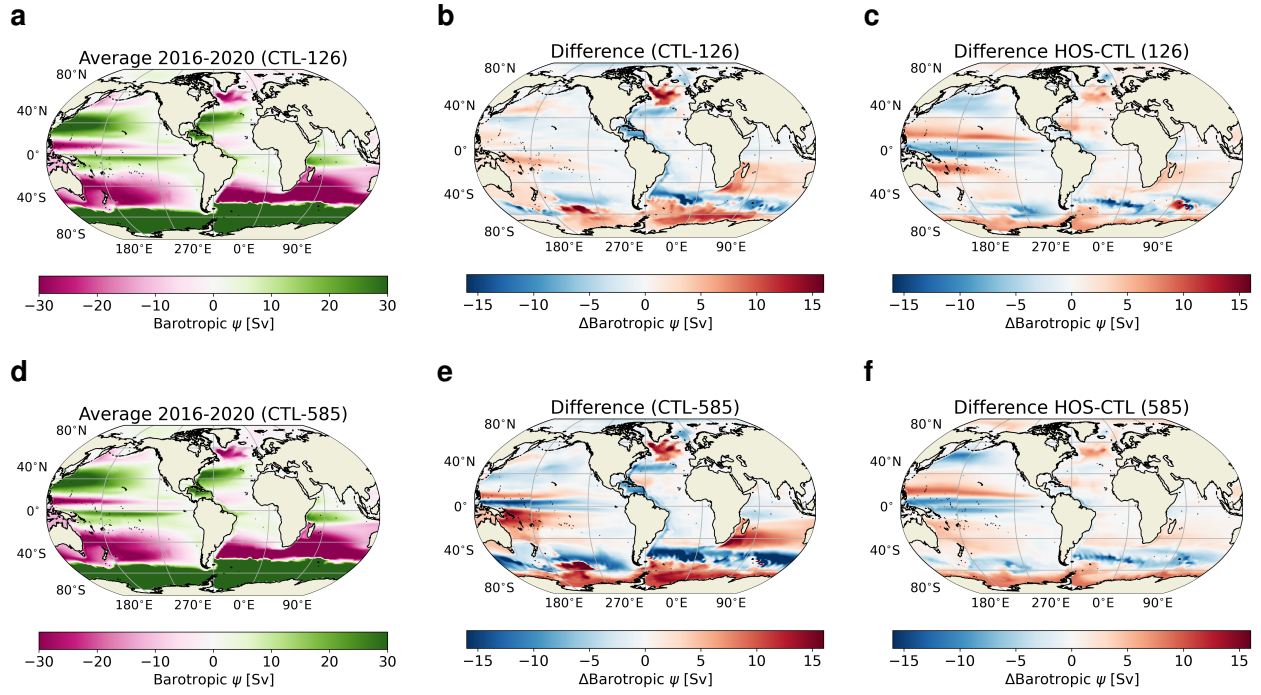


**Figure S17.** Temperature averaged over the entire water column in °C for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.

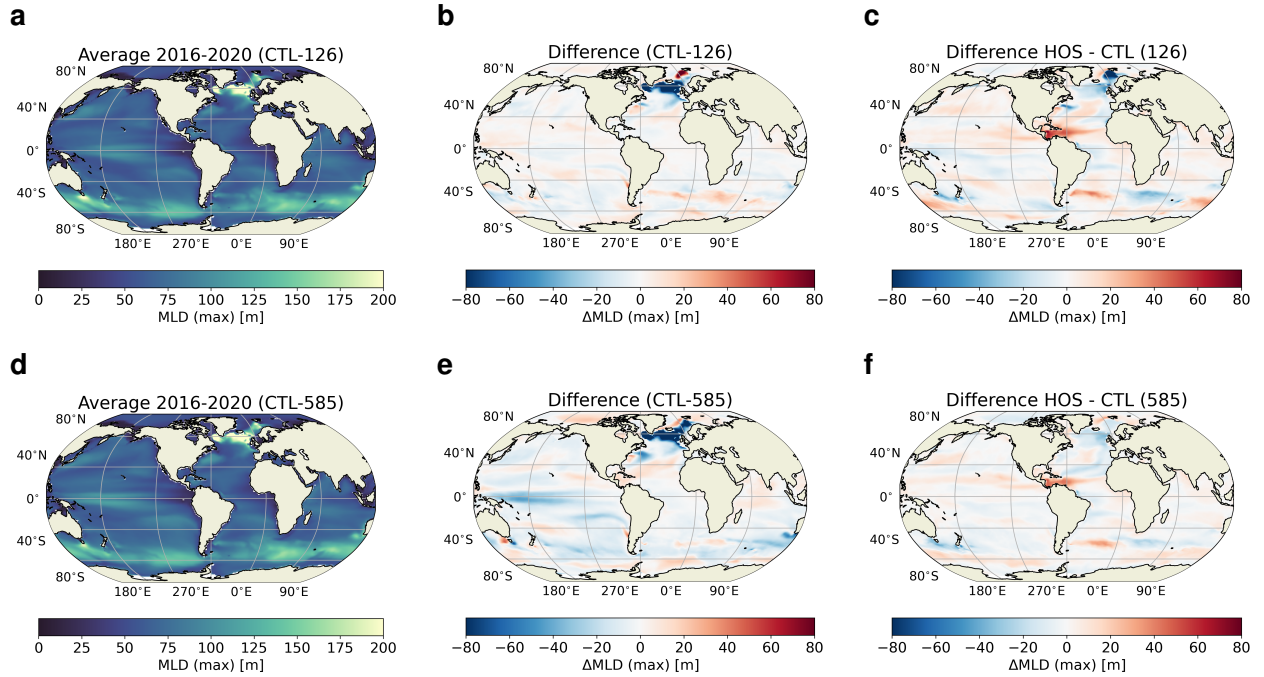




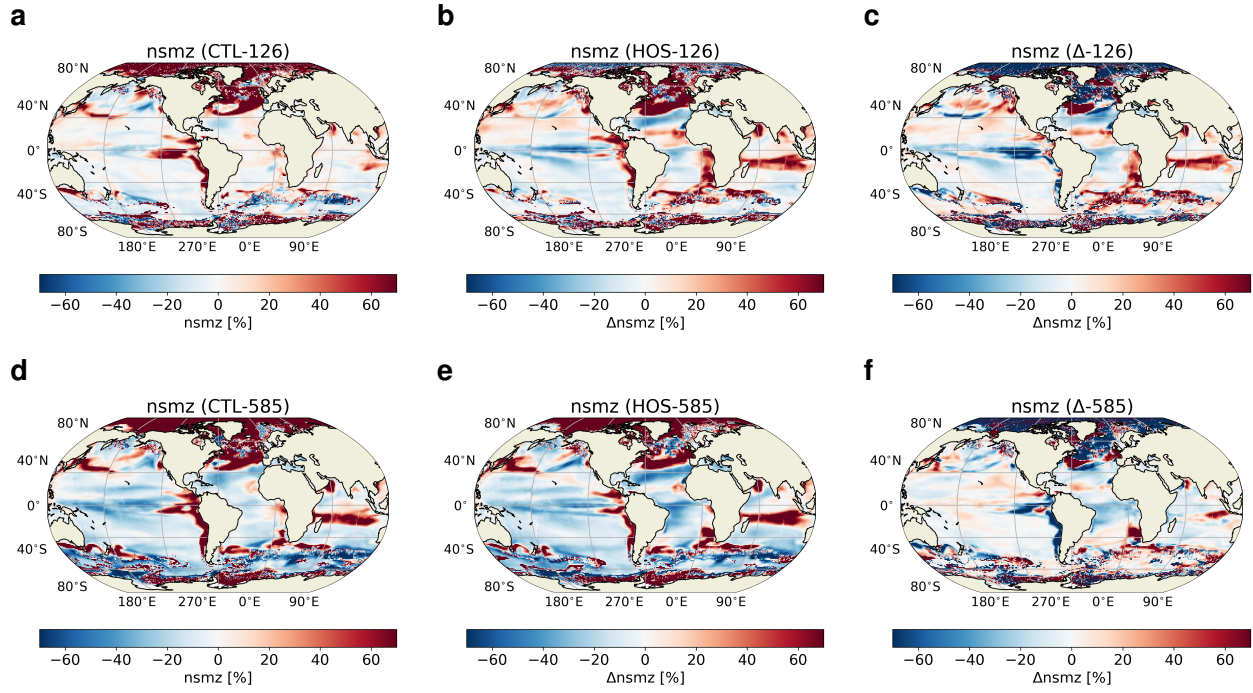
**Figure S18.** Bottom temperature in °C for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



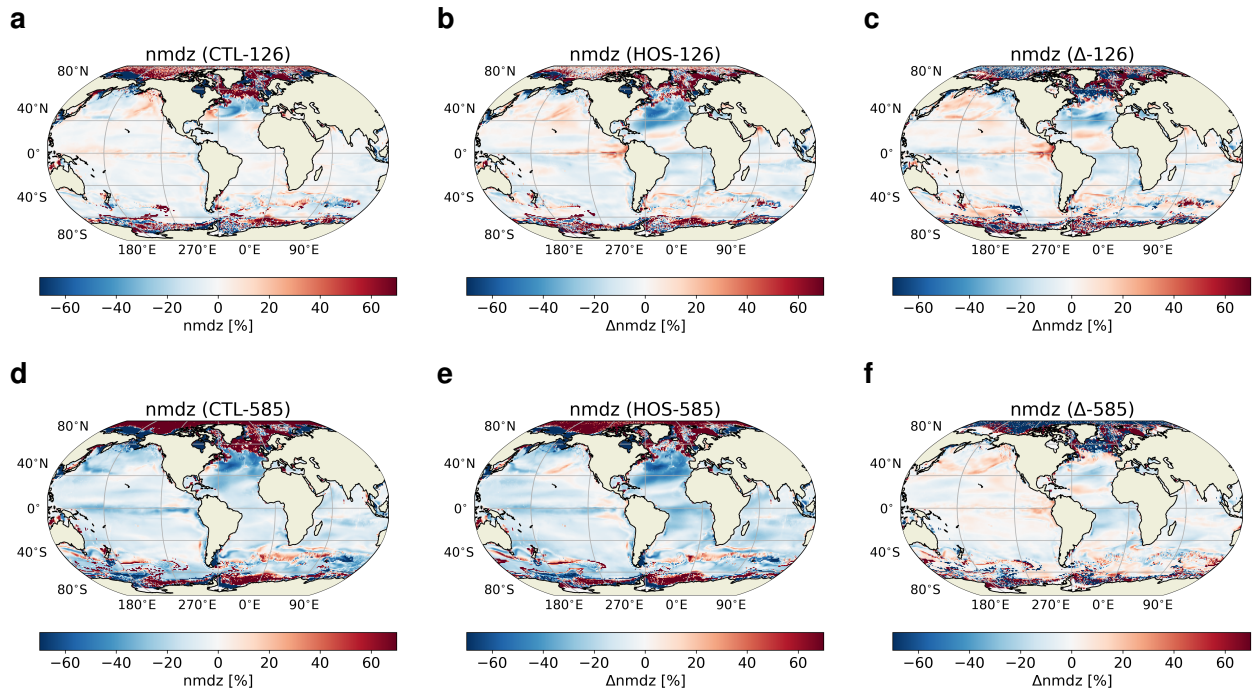
**Figure S19.** Barotropic stream function (BSF) in Sv for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



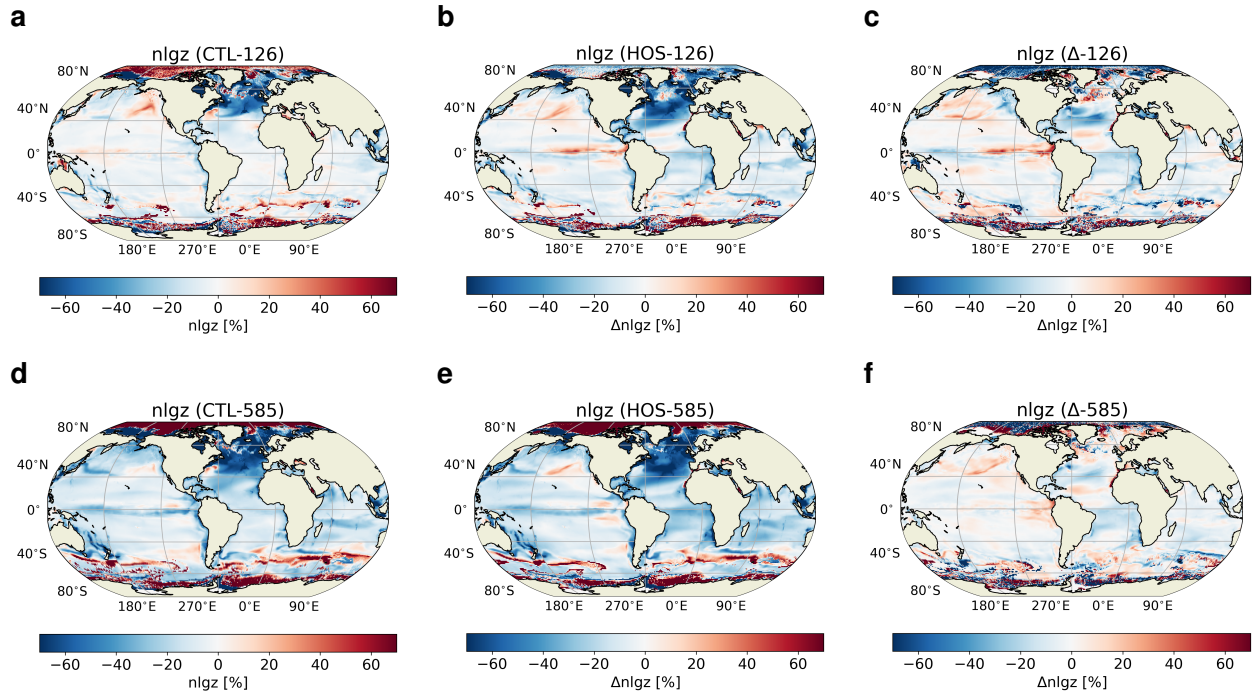
**Figure S20.** Maximum mixed layer depth (MLD) in m for: (a) CTL-126 averaged over 2016-2020, (b) the average over 2016-2020 subtracted from the average over 2095-2099 in CTL-126, (c) CTL-126 subtracted from HOS-126 averaged over 2095-2099, and (d-f) as in (a-c) but for CTL-585 and HOS-585.



**Figure S21.** Relative changes averaged over 2095-2099 compared to 2016-2020 in % for microzooplankton (nsmz) in the CTL simulations (a, d), HOS simulations (b, e), and the difference between the two (c, f). (a-c) are for SSP1-2.6 and (d-f) are for SSP5-8.5.



**Figure S22.** Relative changes averaged over 2095-2099 compared to 2016-2020 in % for mesozooplankton (nmdz) in the CTL simulations (a, d), HOS simulations (b, e), and the difference between the two (c, f). (a-c) are for SSP1-2.6 and (d-f) are for SSP5-8.5.



**Figure S23.** Relative changes averaged over 2095-2099 compared to 2016-2020 in % for large zooplankton (krill; nlgz) in the CTL simulations (a, d), HOS simulations (b, e), and the difference between the two (c, f). (a-c) are for SSP1-2.6 and (d-f) are for SSP5-8.5.

**Table S1.** Relative change in % of total phytoplankton (TP), small phytoplankton (SP), diatom (DT) and diazotroph (DZ) biomass in 2099 for the difference between the HOS and CTL simulations for different regions in the ocean. Relative change is defined as in the main text as the difference in biomass between 2099 and 2015 divided by the biomass in 2015.

Region		TP		SP		DT		DZ	
		$\Delta$ -126	$\Delta$ -585	$\Delta$ -126	$\Delta$ -585	$\Delta$ -126	$\Delta$ -585	$\Delta$ -126	$\Delta$ -585
Arctic Ocean	66°N - 90°N	-21.4	7.64	-44.39	-42.35	-18.82	17.57	-4.74	83.19
Atlantic Ocean	40°N - 66°N	-4.18	-1.28	-71.06	-41.22	3.47	2.73	-45.15	10.54
	15°N - 40°N	-13.24	-5.53	-10.46	-4.24	-25.05	-9.58	-4.11	-1.97
	15°S - 15°N	-6.18	-6.56	-2.36	-10.44	-15.13	-0.12	-4.08	-2.96
	15°S - 40°S	-3.31	-6.84	17.66	10.41	-26.89	-27.84	0.12	-1.61
	40°S - 66°S	-6.27	1.32	15.53	-12.19	-15.76	7.12	16.47	9.41
Pacific Ocean	40°N - 66°N	2.13	-1.47	9.70	-1.66	1.75	-1.1	-70.96	-109.22
	15°N - 40°N	3.43	3.19	2.59	1.47	5.33	6.62	-3.76	-2.87
	15°S - 15°N	2.93	2.80	-3.08	-5.74	9.71	14.41	2.45	3.69
	15°S - 40°S	-6.74	0.17	-10.46	-1.33	0.30	4.00	1.41	0.45
	40°S - 66°S	-4.83	-1.04	2.44	-8.08	-16.36	7.23	36.93	86.38
Indian Ocean	North of 15°S	-3.49	-2.42	14.93	2.38	-31.46	-10.41	-0.50	-1.20
	15°N - 40°N	-2.30	-4.32	5.28	-3.66	-20.96	-7.57	1.03	1.37
	40°N - 66°N	-6.14	-1.86	-0.13	6.72	-14.12	-16.38	186.04	367.42
Southern Ocean	66°S - 90°S	-2.32	1.25	8.57	14.99	-18.25	-17.38	-11.16	-9.01