Supplements

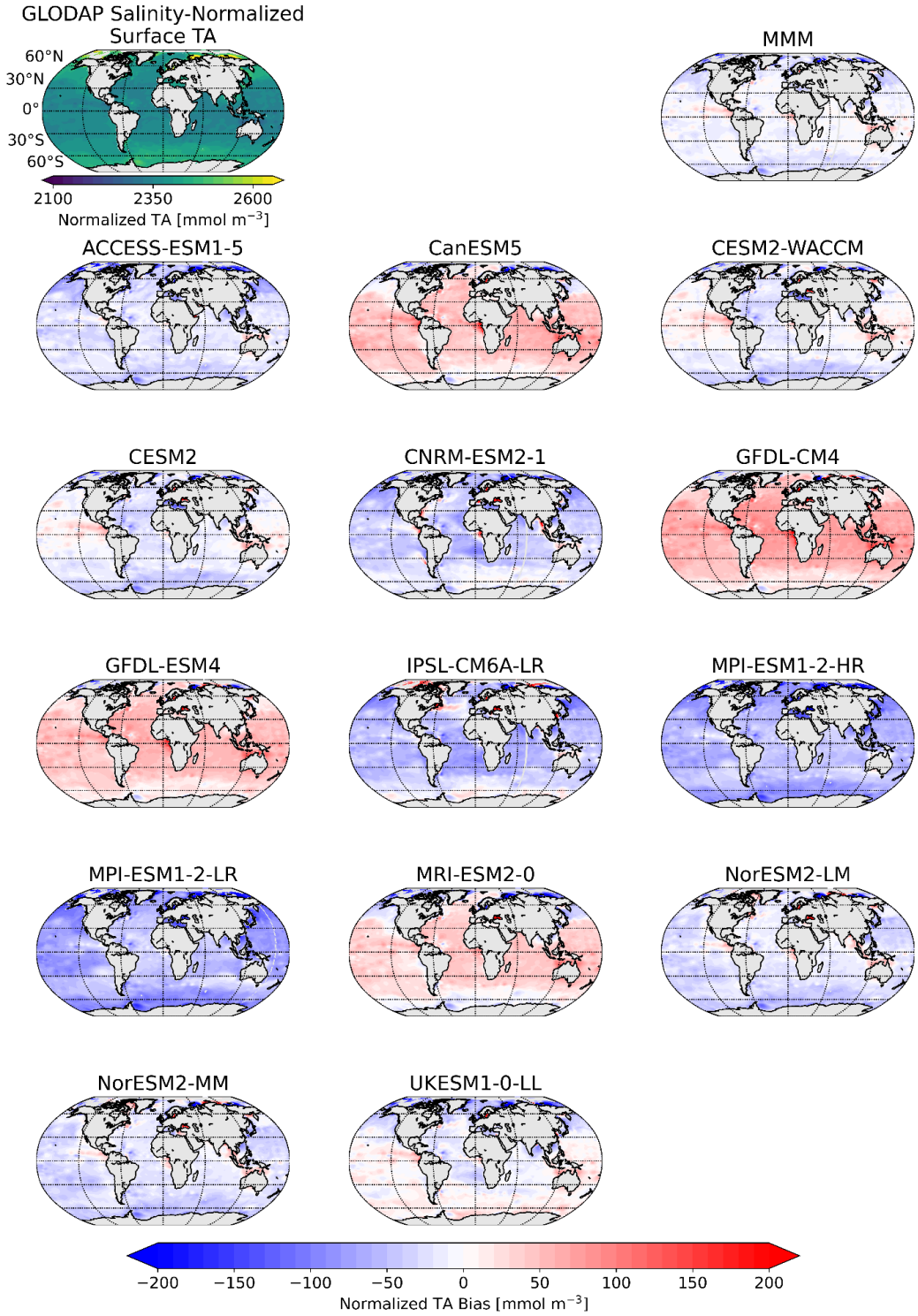

Figure S1: Surface distribution of salinity-normalized TA in GLODAP (top left) and the CMIP6 multi-model-mean (MMM) bias (top right) as well as the individual model's biases.

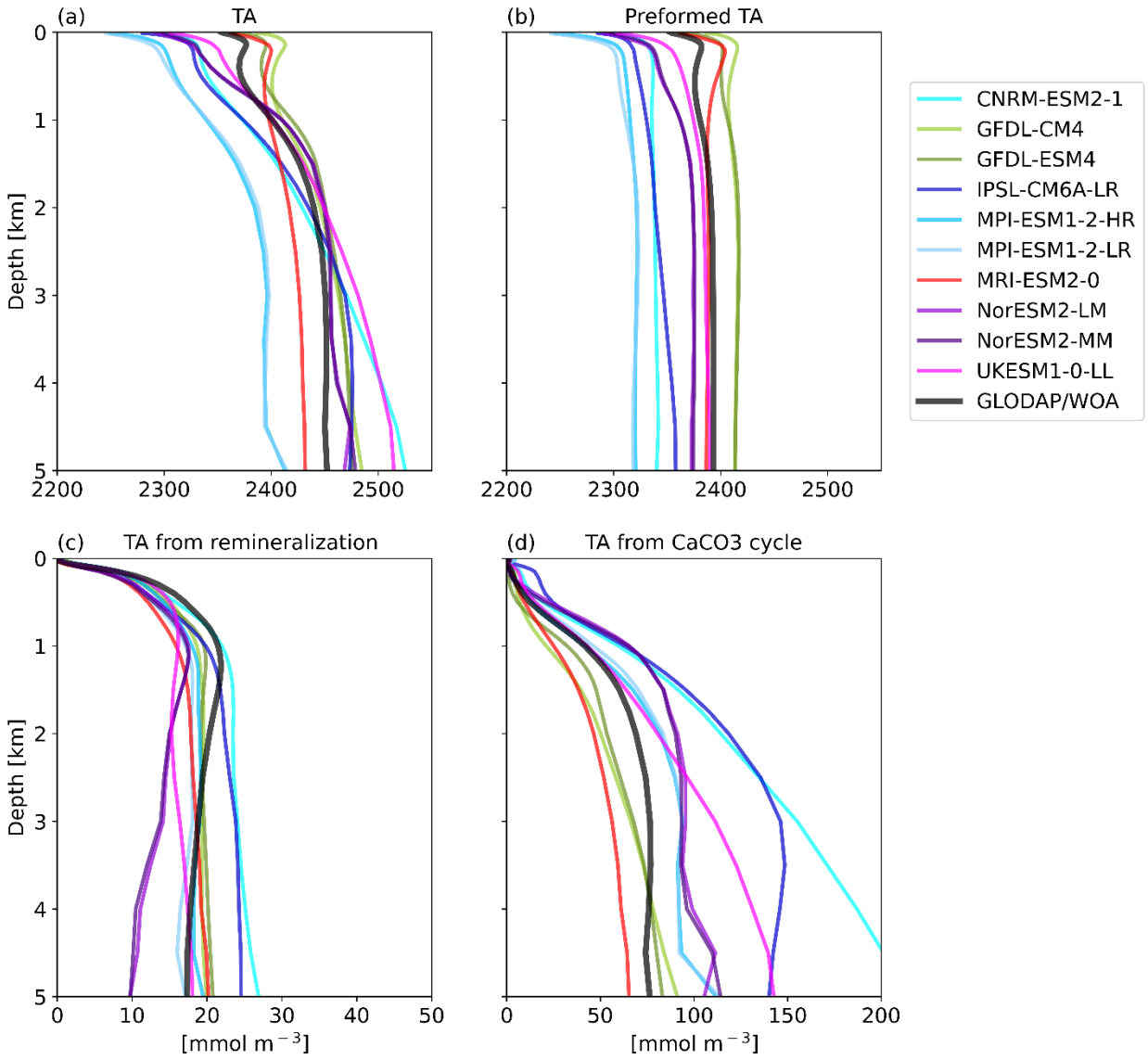

Figure S2: Globally averaged depth profiles of TA, preformed TA (TA^0), TA from remineralization (TA^r) and from calcium carbonate formation and dissolution (TA) in 10 CMIP6 models compared to the GLODAP climatology.*

Table S1: Input values for the CO2SYS calculation of globally averaged TA and DIC, where the CMIP6 output was converted from units of mmol m^{-3} to µmol kg^{-1} using a seawater density of 1026 kg/m^3.

Modelname	**Mean surface TA [mmol m^{-3}]**	**Mean surface DIC [mmol m^{-3}]**	**Mean surface TA [µmol kg^{-1}]**	**Mean surface DIC [µmol kg^{-1}]**
ACCESS-ESM1-5	2330	2050	2271	1998
CanESM5	2367	2093	2307	2040
CESM2-WACCM	2322	2047	2263	1995
CESM2	2318	2043	2259	1991
CNRM-ESM2-1	2311	2042	2252	1990
GFDL-CM4	2403	2121	2342	2067
GFDL-ESM4	2384	2100	2324	2047
IPSL-CM6A-LR	2296	2031	2238	1980
MPI-ESM1-2-HR	2278	2019	2220	1968
MPI-ESM1-2-LR	2270	2015	2212	1964
MRI-ESM2-0	2392	2103	2331	2050
NorESM2-LM	2305	2033	2247	1981
NorESM2-MM	2308	2039	2250	1987
UKESM1-0-LL	2323	2054	2264	2002
GLODAP	**2354**	**2071**	**2294**	**2019**

Table S2: pCO2 differences in % with respect to GLODAP after an artificial TA increase of 100, 200, 500 or 1.000 µmol kg^{-1} for each model as computed with CO2SYS. This computation does NOT account for ocean-air exchange of CO_2 or for chemical reaction upon alkalinity addition. The minimum and the maximum difference values for each case are marked in bold.

TA increase (µmol kg^{-1})	**100**	**200**	**500**	**1000**
Modelname	**pCO_2 difference compared to GLODAP in %**			
ACCESS-ESM1-5	0.16	0.00	-0.24	**-0.41**
CanESM5	6.90	6.54	6.00	5.71
CESM2-WACCM	2.83	2.44	1.86	1.50
CESM2	2.53	2.14	1.54	1.17
CNRM-ESM2-1	6.06	5.38	4.36	3.75
GFDL-CM4	4.22	4.26	4.34	4.44
GFDL-ESM4	1.54	1.63	1.77	1.89
IPSL-CM6A-LR	7.70	6.81	5.47	4.66
MPI-ESM1-2-HR	10.63	9.39	7.55	6.45
MPI-ESM1-2-LR	**12.98**	**11.51**	**9.33**	**8.04**
MRI-ESM2-0	**-1.02**	**-0.73**	**-0.28**	0.03
NorESM2-LM	3.55	3.01	2.18	1.67
NorESM2-MM	5.83	5.15	4.12	3.50
UKESM1-0-LL	6.99	6.33	5.33	4.75