



Supplement of

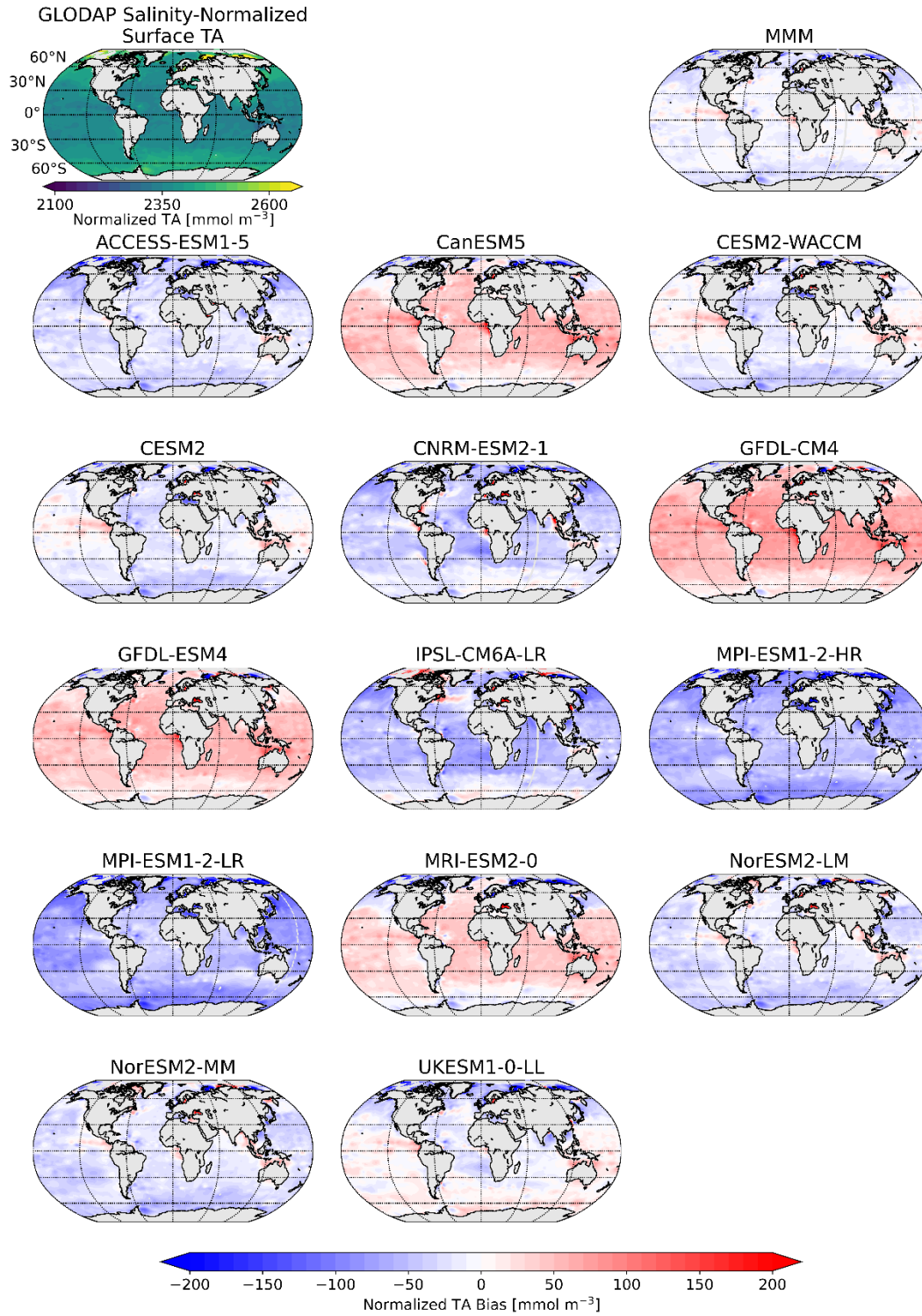
Alkalinity biases in CMIP6 Earth system models and implications for simulated CO₂ drawdown via artificial alkalinity enhancement

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Supplementary figures and tables



10 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.

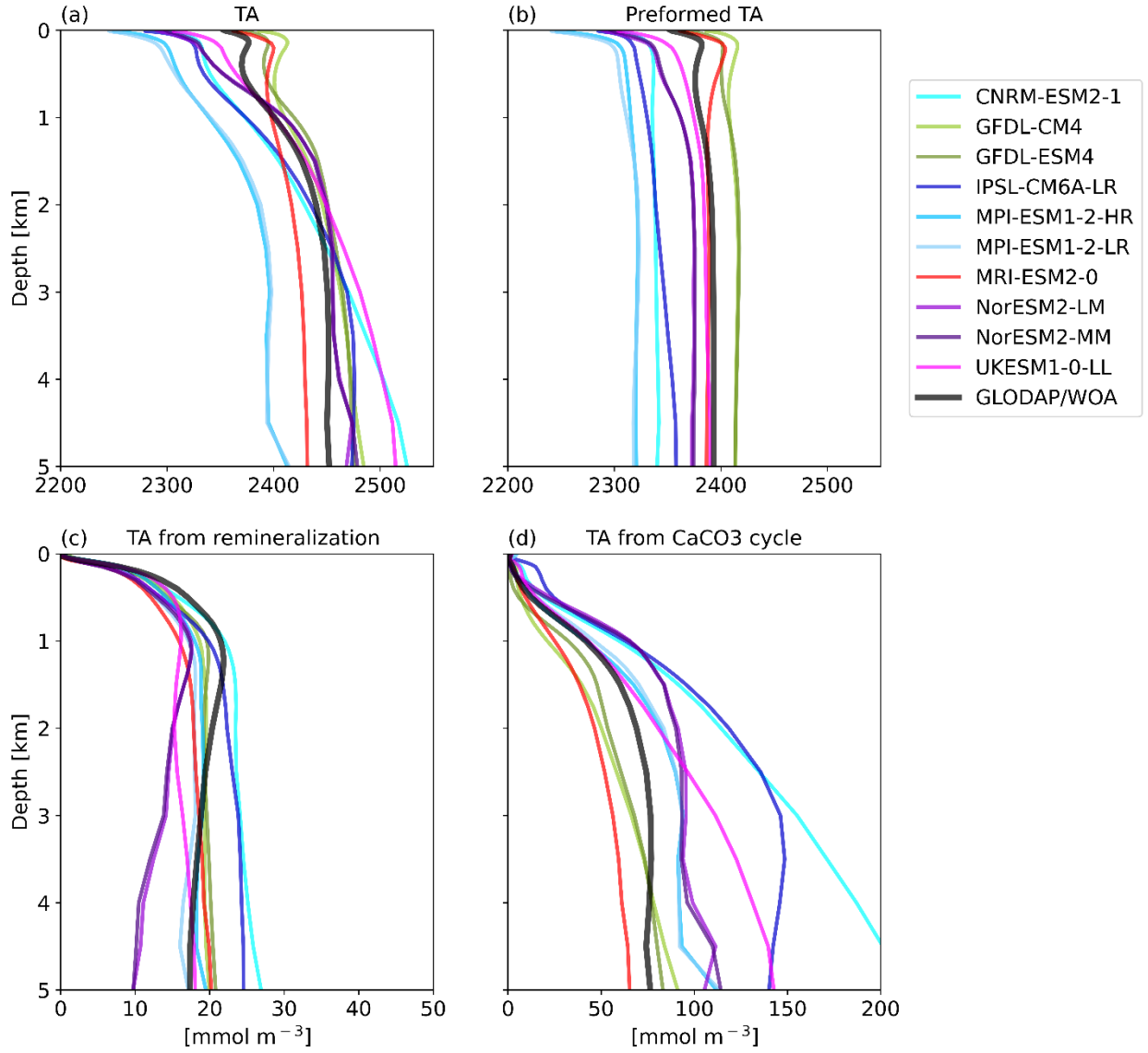


Figure S2: Globally averaged depth profiles of TA, preformed TA (TA^0), TA from remineralization (TA^r) and from calcium carbonate formation and dissolution (TA^*) in 10 CMIP6 models compared to the GLODAP climatology.

- 15 *Table S1: Input values for the CO2SYS calculation of globally averaged TA, DIC and pCO₂, where the CMIP6 TA and DIC output was converted from units of mmol m⁻³ to μmol kg⁻¹ using a seawater density of 1026 kg/m³.*

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]	Mean surface pCO ₂ [μatm]
ACCESS-ESM1-5	2330	2050	2271	1998	291
CanESM5	2367	2093	2307	2040	309
CESM2-WACCM	2322	2047	2263	1995	296
CESM2	2318	2043	2259	1991	295
CNRM-ESM2-1	2311	2042	2252	1990	302
GFDL-CM4	2403	2121	2342	2067	306
GFDL-ESM4	2384	2100	2324	2047	298
IPSL-CM6A-LR	2296	2031	2238	1980	304
MPI-ESM1-2-HR	2278	2019	2220	1968	309
MPI-ESM1-2-LR	2270	2015	2212	1964	314
MRI-ESM2-0	2392	2103	2331	2050	293
NorESM2-LM	2305	2033	2247	1981	296
NorESM2-MM	2308	2039	2250	1987	301
UKESM1-0-LL	2323	2054	2264	2002	305
GLODAP	2354	2071	2294	2019	292

- 20 *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 CO₂ 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