

*Global Biogeochemical Cycles*

**Supporting Information for**

**Alternative histories: Synthetic large ensembles of sea-air CO<sub>2</sub> flux**

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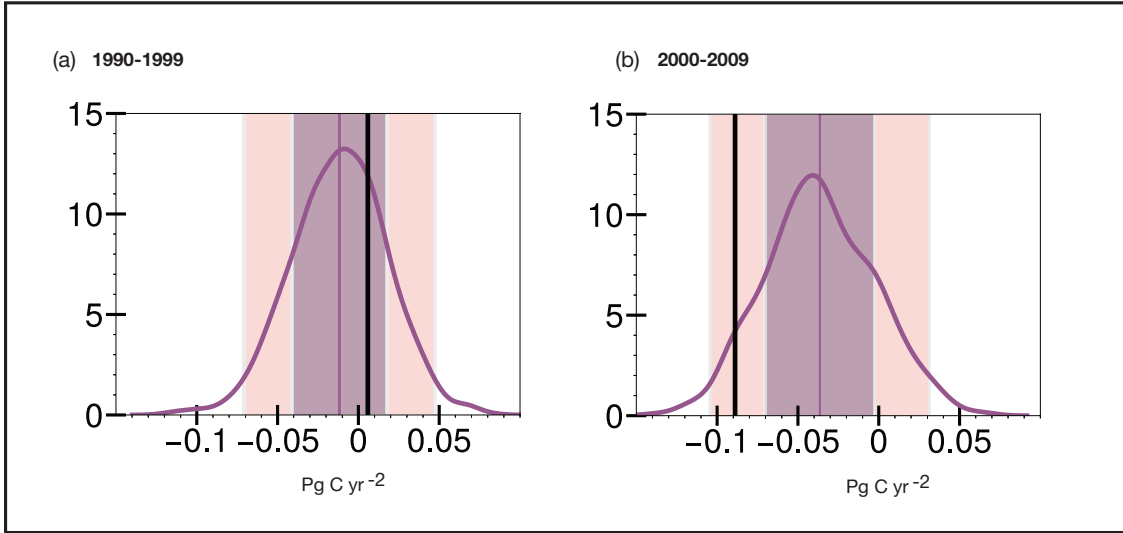
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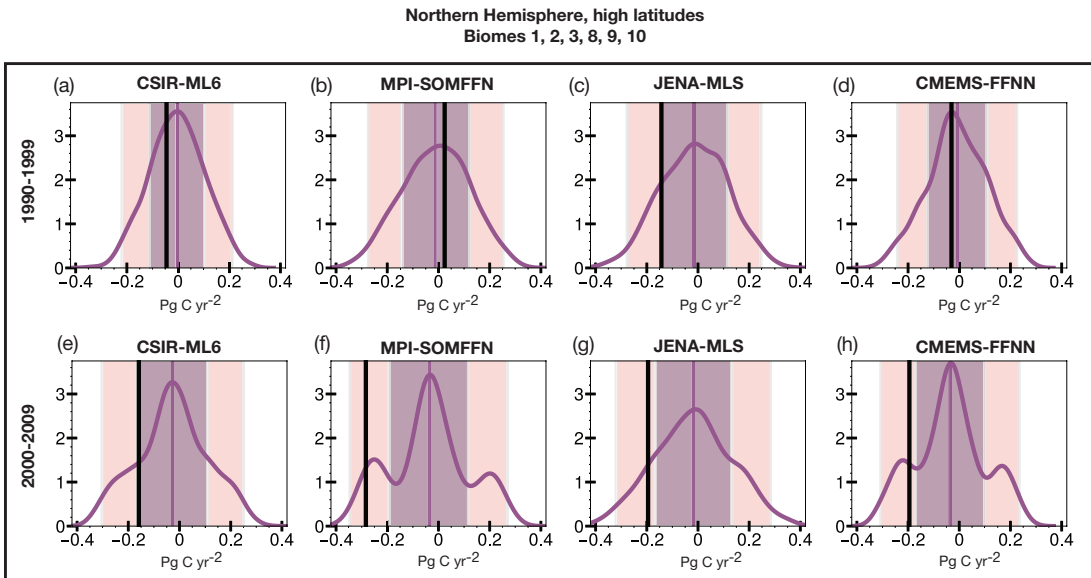
**Figures S1 to S5**

**Introduction**

**This supporting information provides the average of the trends of the four observation-based products discussed, as well as trends in additional regions of the ocean during 1990-1999 and 2000-2009. Additional supporting information includes super-biomes of the Northern hemisphere high latitudes, Northern hemisphere subtropics, Southern hemisphere subtropics, and Equator.**

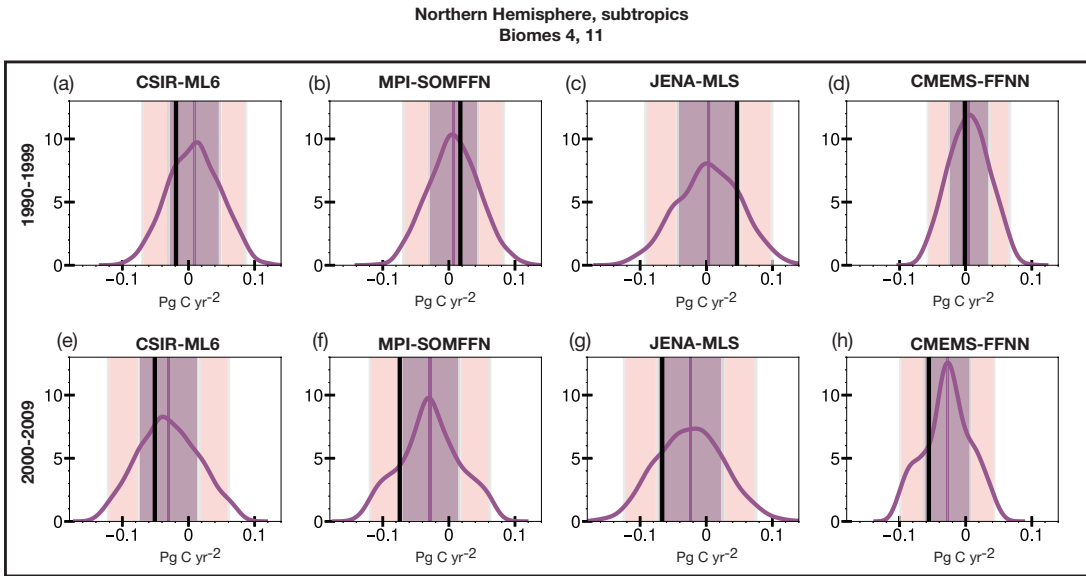


**Figure S1. Same as Figure 4 but for the average of all observation-based products. Probability density functions (kernel density estimation, purple curves) of decadal trends in globally integrated sea-air CO<sub>2</sub> flux for (left) 1990-1999 and (right) 2000-2009, as estimated from the synthetic ensemble of the average of CSIR-ML6, MPI-SOMFFN, JENA-MLS, and CMEMS-FFNN observation-based products. Solid purple vertical lines show the ensemble mean trend, and the 1-sigma (67%) and 2-sigma (95%) confidence intervals are shaded in purple and pink respectively. Solid black lines show the observed decadal trend from each product. Negative trends correspond to increased ocean uptake with time.**

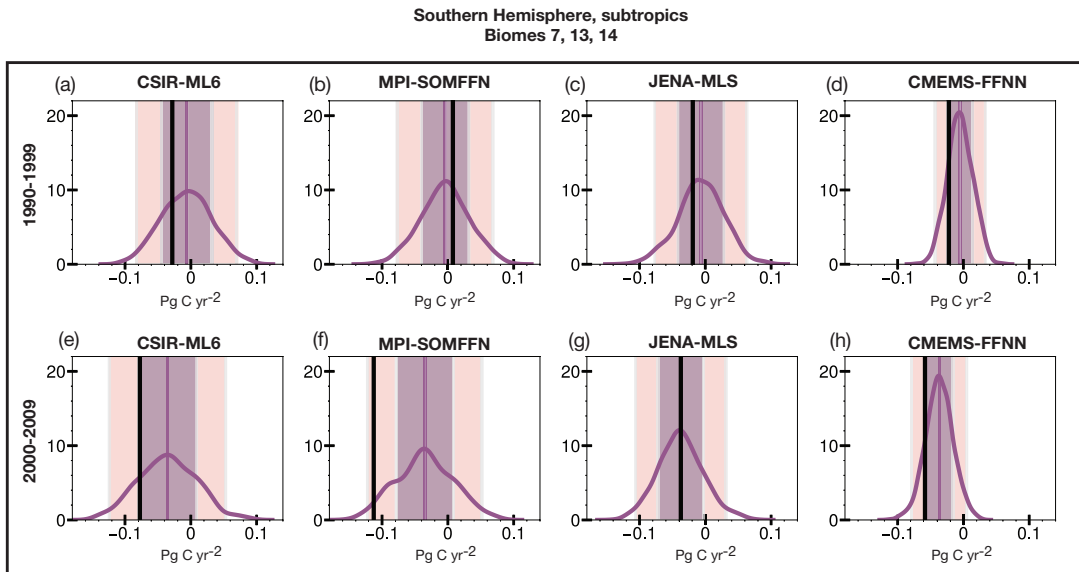


**Figure S2. Same as Figure 5 but for Northern hemisphere high latitude super-biome. Probability density functions (kernel density estimation, purple curves) of decadal trends in regionally integrated sea-air CO<sub>2</sub> flux for (first row) 1990-1999 and (second row) 2000-2009, as estimated from synthetic ensembles of the (first column) CSIR-ML6, (second column) MPI-SOMFFN, (third column) JENA-MLS, and (fourth column) CMEMS-**

**FFNN observation-based products. Solid purple vertical lines show the ensemble mean trend, and the 1-sigma (67%) and 2-sigma (95%) confidence intervals are shaded in purple and pink respectively. Solid black lines show the observed decadal trend from each product. Negative trends correspond to increased ocean uptake with time. Southern hemisphere high latitudes, referenced as the Southern Ocean, are shown in Figure 5. Super-biome for Southern hemisphere high latitudes includes the Southern Ocean Ice (17), Subpolar (16) and Subtropical (15) Seasonally Stratified biomes (*Fay and McKinley, 2014*).**

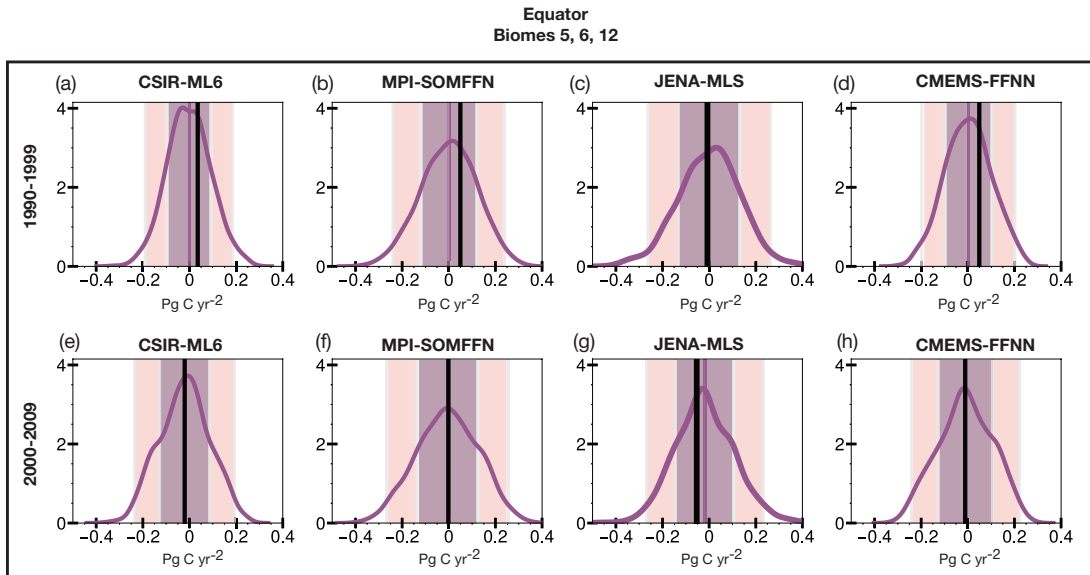


**Figure S3. Same as Figure 5 but for Northern hemisphere subtropics super-biome. Biomes combined for Northern hemisphere subtropics are the North Pacific (4) and North Atlantic (11) Subtropical Permanently Stratified (*Fay and McKinley, 2014*).**



**Figure S4. Same as Figure 5 but for the Southern hemisphere subtropics super-biome. Biomes combined for Southern hemisphere subtropics are the South Pacific (7),**

**South Atlantic (13) and Indian Ocean (14) Subtropical Permanently Stratified (*Fay and McKinley, 2014*).**



**Figure S5. Same as Figure 5 but for the Equatorial super-biome. Biomes combined for Equator latitudes are the West Pacific (5), East Pacific (6), and Atlantic (12) Equatorial (*Fay and McKinley, 2014*).**