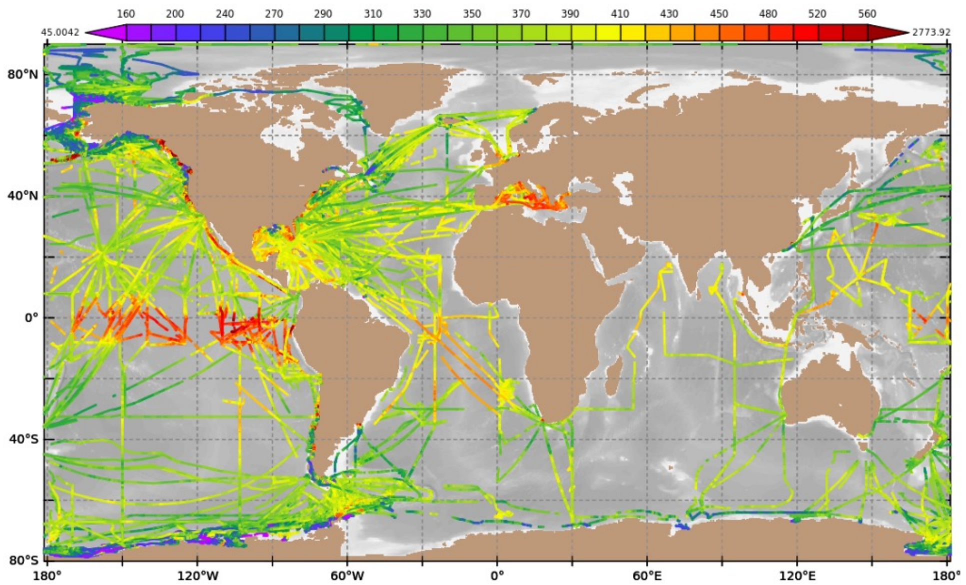
Largest Network of Surface pCO_2 data in the world.

FY 2023
HIGHLIGHTS



~ 9 M data points since 2005. Represents ~¼ of world wide data.

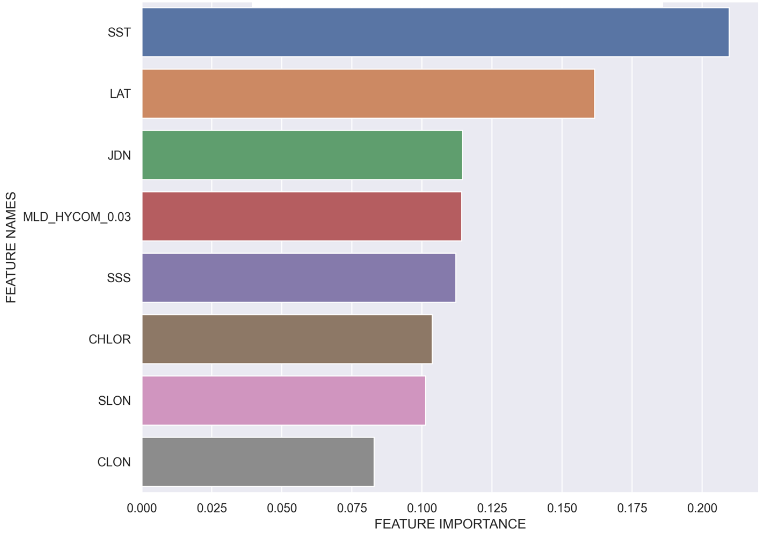
2020, 2021 and 2022 had a 40% data loss compared to previous years

Contributes to the GCB-2023 estimate of the Ocean sink of 2.8 +/- 0.4 GtC/year.

Impact of predictor variables on estimates of global sea-air CO_2 fluxes using an Extra Trees machine learning approach

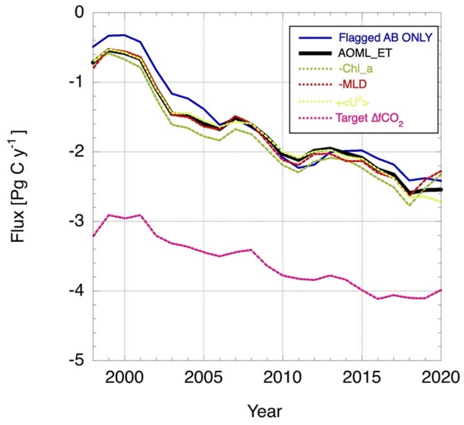
FY 2023 HIGHLIGHTS

FEATURE IMPORTANCE



- Location (sum of Lat, SLON and CLON) has the greatest importance.
- SST has second due to strong dependence of physical and chemical factors controlling fCO_{2w}
- Time (JDN, for Julian day) is the main driver of trends due to the increasing atmospheric CO_2 levels over time.

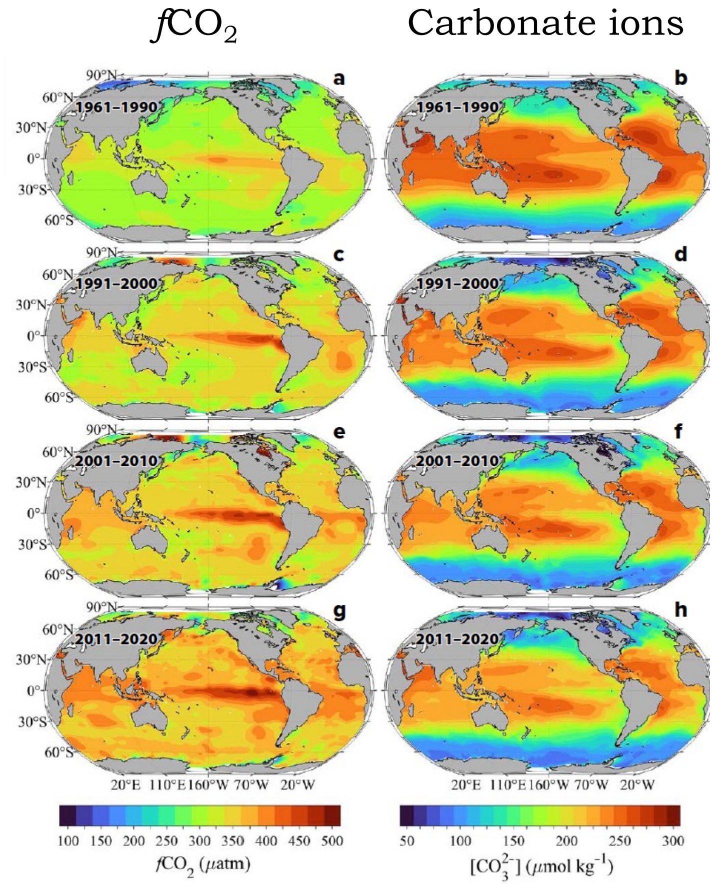
USING DIFFERENT PREDICTOR COMBINATIONS



- No large impacts in the global annual averages of magnitude, variability and trends (except for target).
- Using ΔfCO_2 instead of fCO_{2w} as the target creates poor agreement in both magnitude and trend of the global flux. Reason is unclear but could be sampling bias.
- Effect of data quality (AB flags only) could be due to the sampling bias of high quality measurements toward open ocean and temporal bias of near-shore, higher variability values toward later years.

From Wanninkhof et al., 2024, submitted

Rapidly changing condition put stocks at risk.



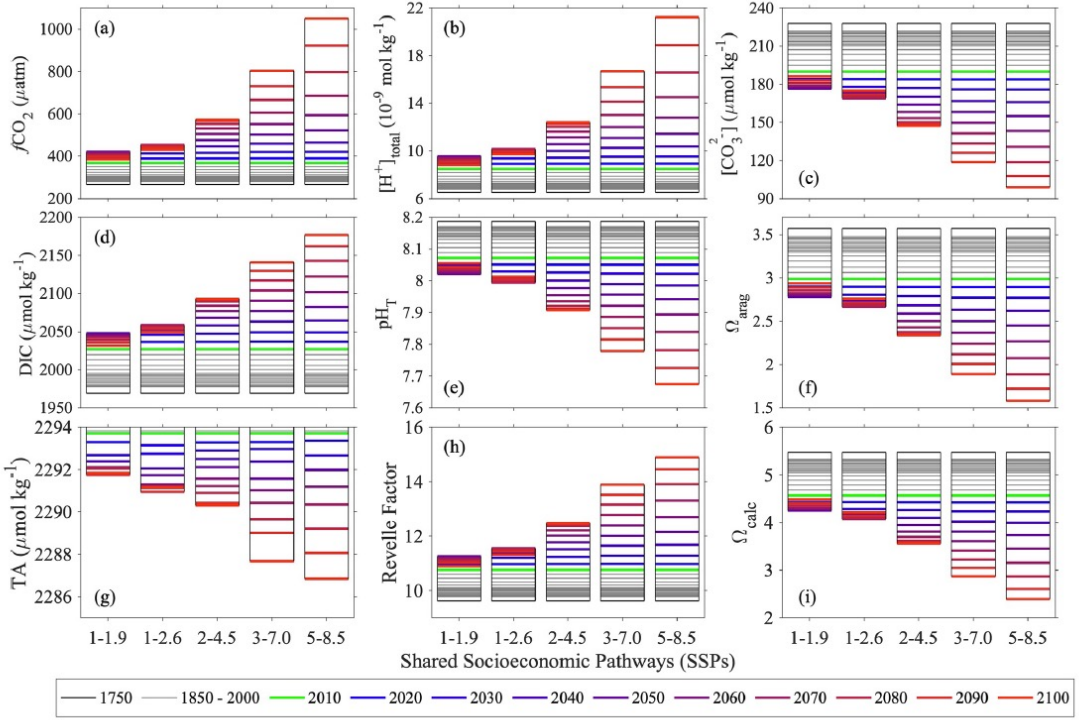
- Using a combination of GO-SHIP and SOOP underway surface observations to evaluate changes in surface ocean carbonate chemistry between 1961 and 2020
- Looking at air-sea anthropogenic CO2 uptake, warming, upwelling, and changing buffering capacity

Conditions are changing rapidly in regions that would normally be considered refugia, with implications for stocks of sensitive species

From Feely et al., 2023

Temporal changes of global surface ocean acidification indicators under different scenarios.

FY 2023
HIGHLIGHTS

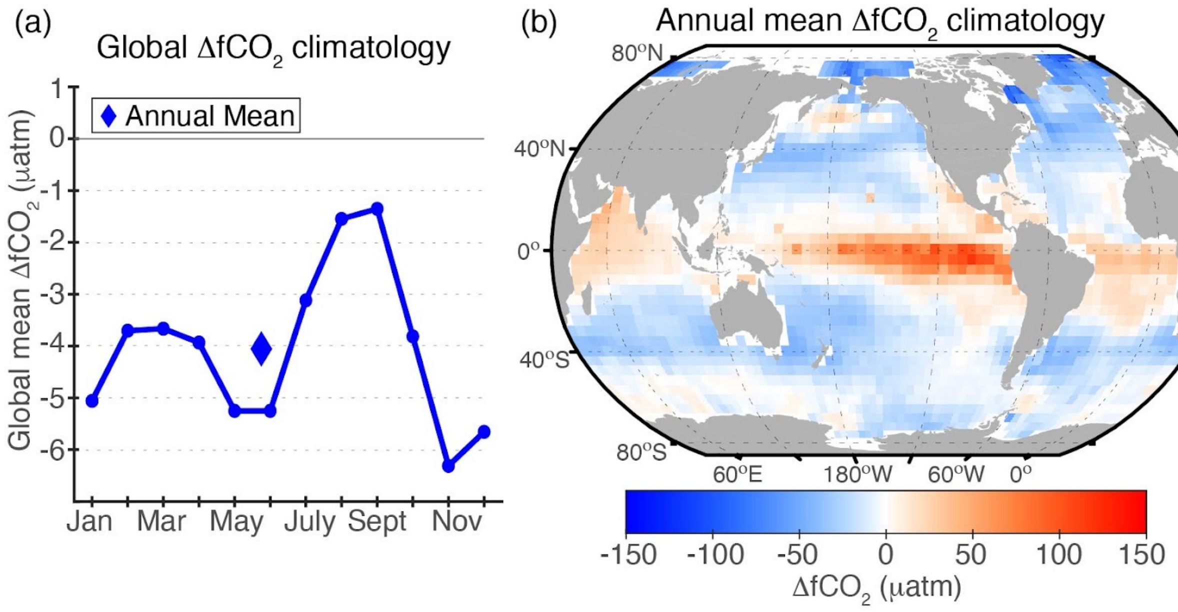


- Combines SOCAT observations and other observational data products to adjust CMIP6 Earth System Model results.
- Maps of 1°x1° decadal averages for 9 parameters (fCO2,pH_T, TA, DIC, $[H^+]$, $[CO3^{2-}]$, Ω_{arag}, Ω_{cal}, Revelle factor).
- Temporal range: 1750 to 2100 using five Shared Socioeconomic Pathways for 2020–2100, representing different future emissions scenarios (SSP1–1.9, SSP1–2.6, SSP2–4.5, SSP3–7.0, and SSP5–8.5).

Temporal changes of global surface ocean acidification indicators (inter-model median values out of 14 CMIP6 Earth System Models after applying adjustments with observational data [including SOCAT data], area-averaged). The *x*-axes labels, 1–1.9, 1–2.6, 2–4.5, 3–7.0, and 5–8.5 indicate the Shared Socioeconomic Pathways: SSP1–1.9, SSP1–2.6, SSP2–4.5, SSP3–7.0, and SSP5–8.5, respectively. From Jiang et al. 2023

An updated climatological mean surface ocean pCO_2, and net sea–air CO_2 flux over the global oceans

FY 2023
HIGHLIGHTS



(a) Global mean ΔfCO2 seasonal climatology from the SOCAT database; annual mean value is indicated by the diamond (-4.1µatm). (b) Map of annual ΔfCO2 climatology. from Fay et al., 2024 (submitted)

- Constructed using SOCATv2022
- ~7x more data than the last climatology (Takahashi et al. 2009).
- No time normalization procedure (uses ΔfCO_2 rather than pCO_{2oce})