

Observed amplification of the seasonal CO₂ cycle at the Southern Ocean Time Series: Supplementary Material

1 SUPPLEMENTARY FIGURES

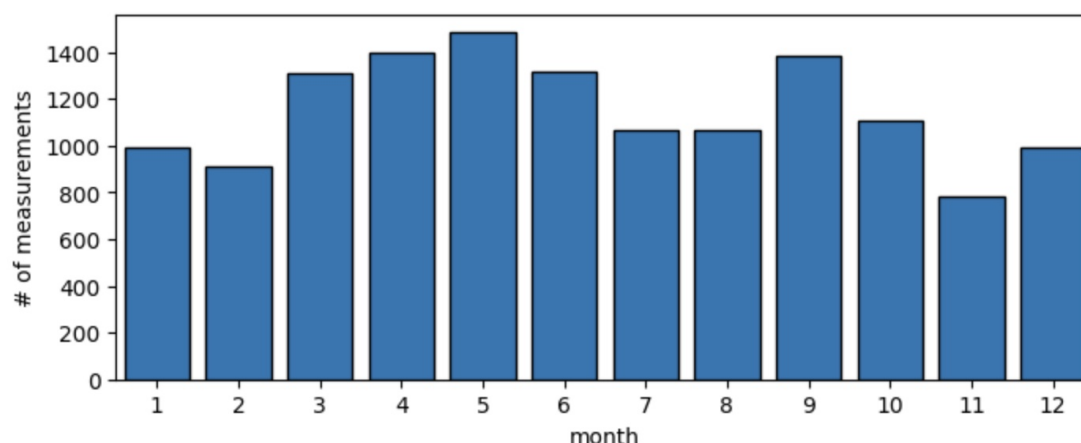


Figure S1. The distribution of pCO₂ observations at the SOTS site by month for all deployments between 2011 and 2021.

Table S1. Trends in winter (August) and summer (December) net primary production (NPP, mg C m⁻² yr⁻¹) and mixed layer depth (MLD, m yr⁻¹) from the CAFE60 reanalysis product based on the period between 2001 and 2020; there are modest decreases (increases) in winter NPP (MLD), and modest increases (decreases) in summer NPP (MLD). These changes may indicate an increased delivery of carbon-rich subsurface water to the upper ocean in the winter, leading to increased winter pCO₂, and a shallower summer mixed layer, leading to increased NPP, and depleted summer pCO₂.

season	NPP	MLD
August	-2.42	15.7
December	5.54	-0.2

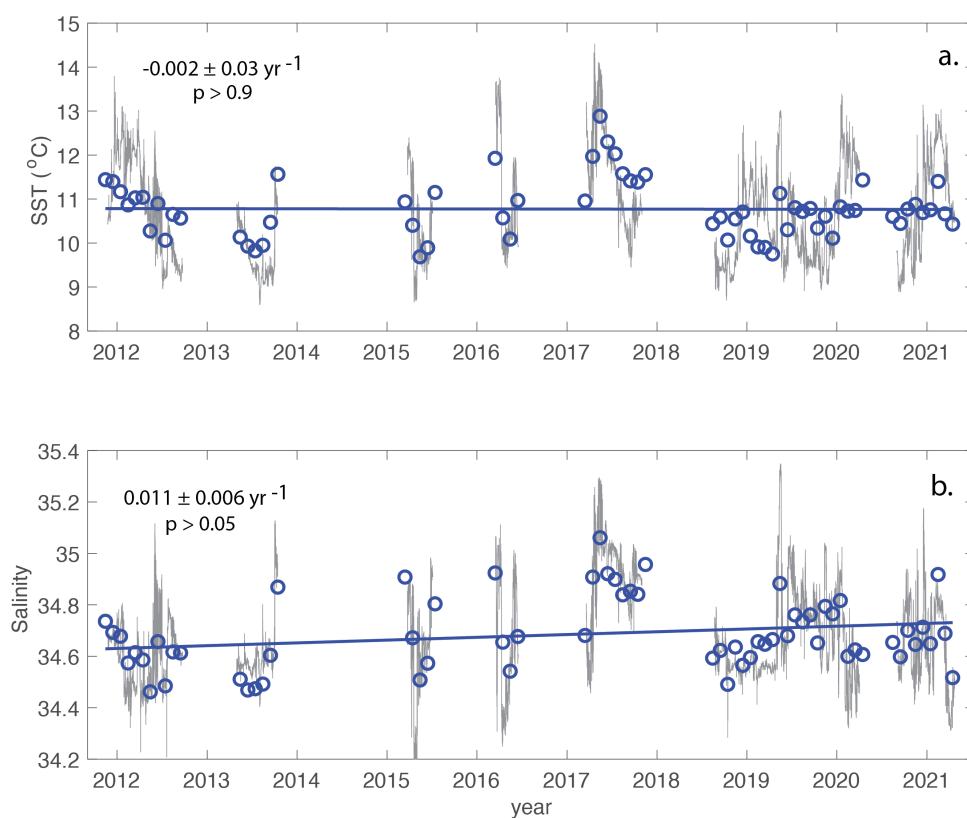


Figure S2. Time series of hourly (grey) sea surface temperature (a, SST) and salinity (b) between 2011 and 2021 at the SOTS site. Also shown are the deseasoned monthly values (blue circles) and the trend lines associated with these data computed as described in the Methods section in the main text.

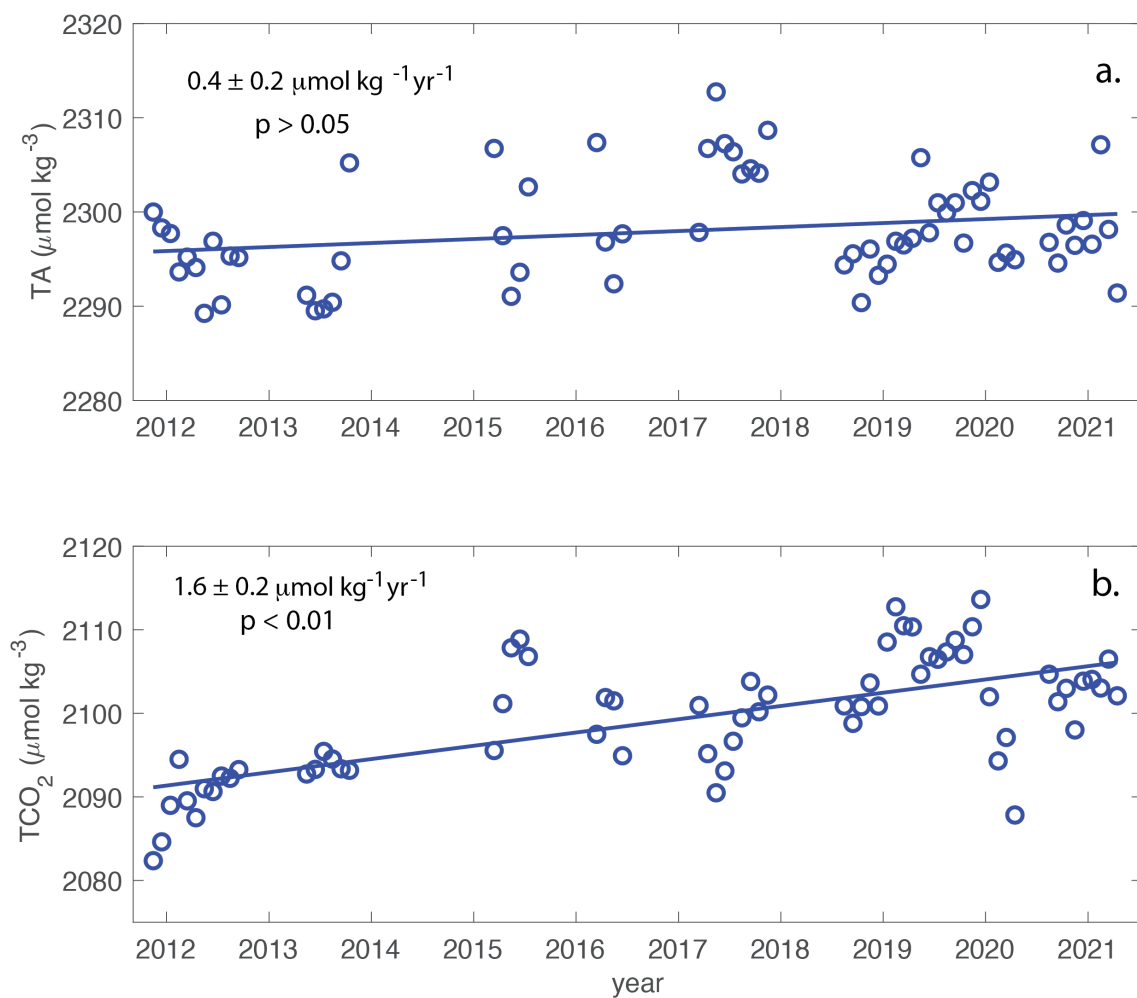


Figure S3. Deseasoned observations at SOTS: a) TA computed as function of salinity and b) TCO_2 computed with pCO_2 and TA. Trend lines in both panels are computed as described in the Methods section in the main text; there is no statistically significant trend in TA.

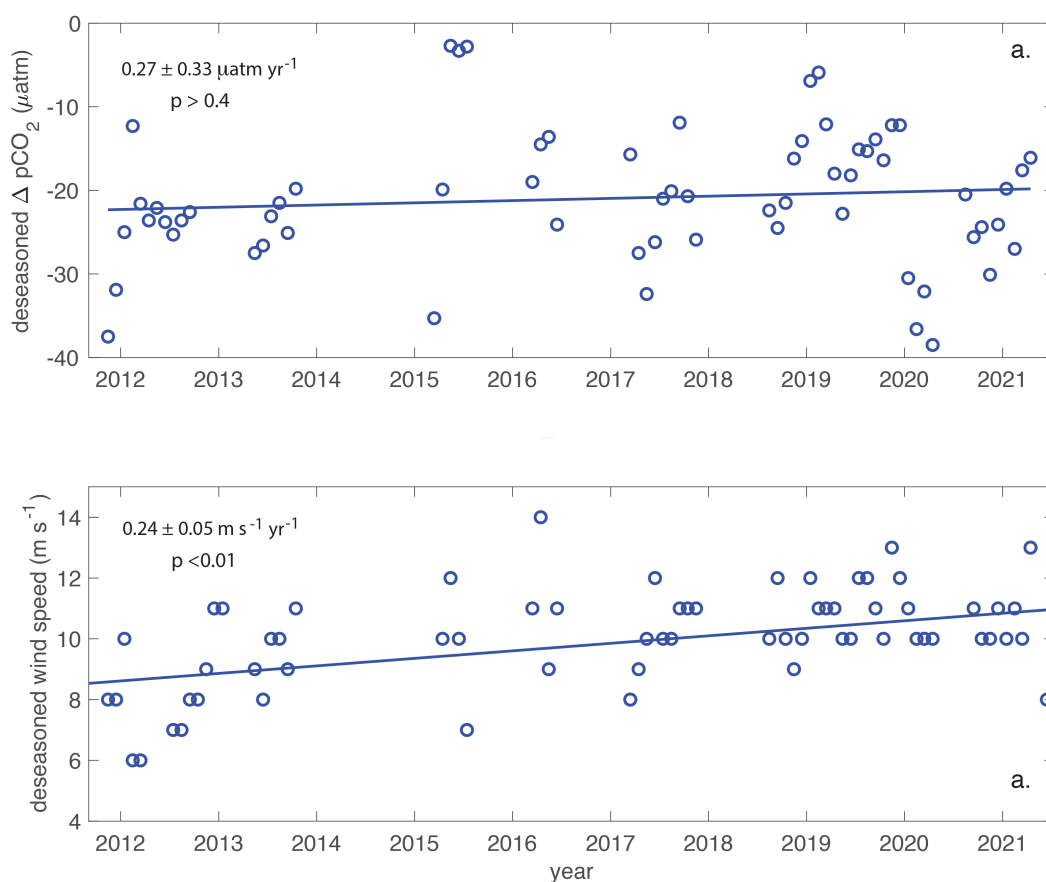


Figure S4. Deseasoned observations at SOTS: a) $\Delta p\text{CO}_2$ and b) wind speed. Trend lines in both panels are computed as described in the Methods section in the main text; note that for both parameters, the r^2 associated with the trends is quite low ($r^2=0.12$ for $\Delta p\text{CO}_2$, and $r^2=0.23$ for wind speed).