

Reviewer #1

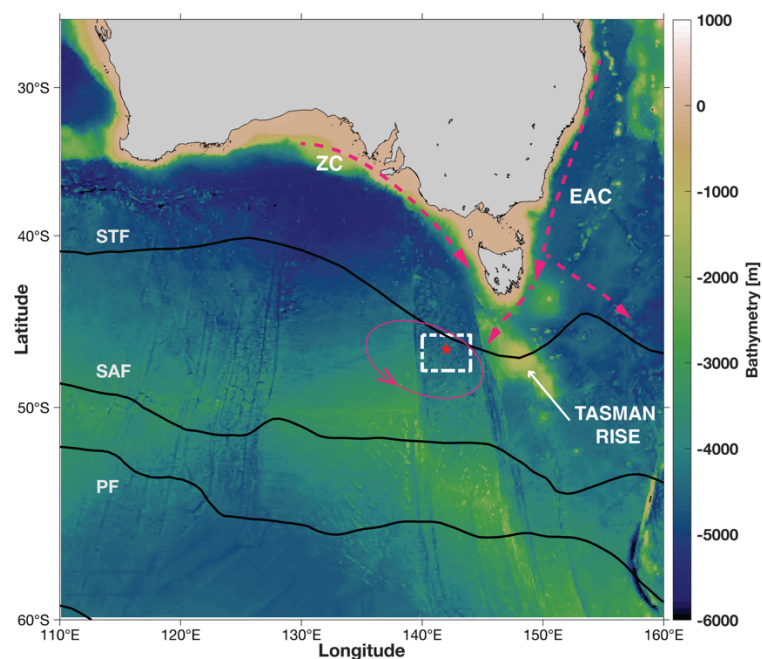
We thank Dr. Nodder for his positive review; below we have provided (in blue text) a response to each comment.

The review undertaken by the authors has made substantive changes to the manuscript that have improved its clarity and suitability for publication. There are still a few typographical and formatting errors that the editorial team should be able to point out to the authors to deal with.

Thank you for the comment, we have been through the manuscript and corrected typographical errors.

The only minor comment is that the revised Figure 1 doesn't have the following information shown on it as indicated in the caption: "the schematic positions of the Zeehan Current (ZC), extensions of the of the East Australian Current (EAC), and a recirculation west of the Tasman Rise following (Herraiz-Borreguero and Rintoul, 2010)." This figure needs to be redrafted as suggested by the caption to show this important physical oceanographic information.

Thank you for the comment, the revised version of Figure 1 (below) has been included in the updated manuscript.



## Reviewer #2

This manuscript presents an integrated and climatological perspective of two decades of multidisciplinary observations collected at the Southern Ocean Time Series (SOTS) site, located in the Subantarctic Zone southwest of Tasmania. The study synthesises a vast array of physical, biogeochemical, and ecological data, including hydrography, carbonate chemistry, net primary production, phytoplankton community composition, and carbon export. The long-term and high-frequency nature of the dataset makes this work especially valuable in the context of climate variability, biogeochemical cycling, and ecosystem dynamics in the Southern Ocean, a region critically under-sampled yet disproportionately important in terms of global carbon and heat uptake.

I compliment the authors for the impressive effort in sustaining such a comprehensive oceanographic time-series programme and for compiling the data in a coherent and accessible form. This manuscript has the potential to serve as a benchmark reference for the Subantarctic region and a valuable resource for future comparative studies.

Overall, the authors have satisfactorily addressed the points raised by the previous reviewers, considerably improving the manuscript in its current version. Nevertheless, in its present form, the manuscript still contains a few minor issues which, in my view, may lead to misinterpretation by the reader. Below, I outline some of these minor comments, along with recommendations for strengthening the manuscript. Thus, the manuscript should definitely be published and will be worthwhile for the oceanographic community.

We thank Dr. Monteiro for the positive and constructive feedback. Below we have provided (in blue text) a response to each comment.

Lines 2, 11, 29 and 34: In the abstract and at various points in the introduction, the authors refer to the export of “particulate carbon”, but it is unclear whether this refers to organic carbon, inorganic carbon, or both. This only becomes clear later in the Results and Discussion sections. It may be beneficial to clarify this distinction from the abstract onwards.

This change has been made in the abstract as suggested.

Line 41: The phrase “low current region” is vague. Consider using “region of weak mean flow” or specifying the typical current velocity observed at the site.

This change has been made as suggested.

Line 44: In the sentence “There is a seasonal evolution of biomass accumulation”, it is not clear which type of biomass is being referred to. I assume the authors mean “phytoplankton biomass”, which should be specified to avoid ambiguity.

Yes, phytoplankton biomass; changed as suggested.

Line 49: I suggest clarifying what depth range is meant by “upper water column” in this context.

This has been added.

Lines 49–52: The citation to Cresswell (2000) should be revised, as it describes the physical characteristics of the Zeehan Current but not nutrient distributions. If nutrient depletion is central to the argument, consider citing relevant nutrient climatologies or other biogeochemical sources. Additionally, the claim that the SAMW is “oxygen-rich” should be revised unless a more appropriate reference is provided; Herraiz-Borreguero & Rintoul (2011) do not discuss oxygen concentrations.

The mention of nutrients in the subtropical water has been removed, and an additional reference of the oxygen-rich SAMW has been added.

Line 49: The names of water masses should be written out capitalised, e.g., “Subtropical Water”, “Subantarctic Mode Water”, etc.

This has been changed.

Line 54: The sentence “Below the SAMW, is cooler, and more saline Antarctic Intermediate Water...” is awkward, especially for non-native speakers. Consider rephrasing it as: “Below the SAMW lies cooler and more saline Antarctic Intermediate Water (AAIW)...”.

Rephrased as suggested.

Line 62: As with “upper water column”, I suggest specifying what depth range is meant by the term “subsurface” here.

This has been added.

Line 64: I recommend including the website address for the Australian Ocean Data Network (AODN) portal directly in the manuscript text, as well for other relevant data sources, even if these are already provided in the “Data availability” section.

These addresses have been added to the Methods section as suggested.

Line 72: “Total alkalinity” is written out in full for the first time here and later referred to in full and acronym “Alk”. I suggest reviewing the manuscript to ensure consistency in introducing full terms and their acronyms; in some cases, terms appear to be defined more than once.

Thank you, these have been corrected.

Line 77: There is a missing full stop before the sentence beginning with “The subsurface instruments...”.

Corrected.

Line 105: Although the authors cite several references regarding quality control procedures, it would be useful to include a sentence indicating the average magnitude or typical range of uncertainty for the measured parameters.

Thank you for the suggestion. The magnitude of the uncertainty for temperature, salinity, dissolved oxygen, and inorganic nutrients have been added.

Line 145: Consider rephrasing the sentence “The SOTS site is characterised by deep mixing in the autumn and winter seasons, in some years to depths of roughly 500 m (Fig.

5b), driven by a combination of local heat fluxes (Schulz et al., 2012), and northern Ekman transport of colder waters (Rintoul and England, 2002).” Suggested revision: “The SOTS site is characterised by deep mixing during the autumn and winter seasons, reaching depths of roughly 500 m in some years (Fig. 5b), driven by a combination of local heat fluxes (Schulz et al., 2012) and northward Ekman transport of colder waters (Rintoul and England, 2002).”

Rephrased as suggested.

Line 156: The sentence “Depending on the longitudinal range considered, the STF may be observed as far south as 48°S” could be clarified. Suggested revision: “In the longitudinal band 140–144°E, the STF may be observed as far south as 48°S.”

Rephrased as suggested.

Figure 5 caption: It would be helpful to include a description of the “thick grey line” when referring to “130–150°E (thick line)”.

This has been added.

Line 160: In the phrase “advection of waters with more polar characteristics”, please specify which water masses are being referred to.

This has been clarified as suggested.

Lines 162–164: The meaning of “mean magnitude of the seasonal temperature cycle at the surface is 4°C” is unclear. If referring to the seasonal amplitude (i.e., maximum minus minimum), I suggest rephrasing to make that explicit.

This has been rephrased as suggested.

Lines 162–164: In addition, the statement “with summer maximum of roughly 12°C” appears to be inconsistent with the earlier declaration “temperatures ranging from summer maxima of 15°C to winter minima of ~8°C”. Please consider clarifying whether these refer to different time periods, depths, or datasets.

The 12 degree maximum refers to the (smoothed) climatological seasonal cycle, while the 15 degree maximum to the monthly observations; this has been clarified.

Line 176: It is unclear why the sentence begins with “The seasonality in temperature is moderate as described above”, as both this sentence and the entire paragraph refer to the carbonate system. Perhaps a more suitable phrasing would be: “Since temperature seasonality is moderate, as described above, the seasonal cycle of pCO<sub>2</sub> is dominated by the impact of biological productivity...”

This has been rephrased as suggested.

Line 177: The term “inorganic carbon (TCO<sub>2</sub>)” has already been defined earlier in the manuscript. Please revise the use of full terms and respective acronyms throughout the manuscript to avoid redundancy.

Corrected.

Line 180: The sentence “The seasonality in alkalinity (Alk) is computed from salinity...” could be more clearly phrased as: “Alk is computed from salinity and thus exhibits similarly modest seasonality”.

Rephrased as suggested.

Line 183: The phrase “TCO<sub>2</sub>-rich water from below” might be clearer if reworded to: “...TCO<sub>2</sub>-rich water from deeper layers”.

Rephrased as suggested.

Lines 195–196: The phrase “Alk ranges from roughly 2280  $\mu\text{mol kg}^{-1}$  at 500 m to greater than 2350  $\mu\text{mol kg}^{-1}$  below 1500 m” seems to refer to measured Alk values, rather than those estimated from salinity. If so, it would be helpful to state explicitly that these are “measured Alk”. The same applies to the sentence beginning “The relationship between ‘measured Alk’ and salinity...”.

Yes, the quoted ranges are for the measured Alk and not those estimated from salinity. This has been rephrased for clarity.

Line 199: The terms “Subtropical surface waters” and “mode and intermediate waters” should be capitalised as they refer to water masses, i.e., “Subtropical Surface Waters”, “Mode Waters”, and “Intermediate Waters”.

Corrected.

Line 203: The statement “...the SOTS site exhibits the high-nutrient...” is not evidently supported by Figure 2. Consider either providing a different figure or referencing supporting data to substantiate this claim.

Additional references have been added.

Line 261 / Table 2: Under the section “Emergence of Trends”, it would be useful to indicate the exact period over which each trend was observed and calculated. This would help readers better contextualise the findings.

This has been added to the caption of Table 2 as suggested.

Lines 314 and 318: The term “calcium carbonate” was defined previously in the manuscript. Please avoid redefining terms unless necessary for clarity.

Corrected.

Line 362: The phrase “Time-series of upper ocean nutrients and biomass...”, does it refer specifically to phytoplankton biomass?

Yes, phytoplankton biomass. This has been added to the revised text.

Line 367: “Net community production (NCP)” has already been introduced earlier.

Corrected.

Lines 384–385: I suggest including website address for the OceanSITES network and appropriately referencing GLODAP and SOCAT datasets.

Added.