

Point-by-point response to editor

We appreciate your comments, which are all valuable and helpful for revising and improving our manuscript. We have considered your comments carefully and have made appropriate corrections. As you can see from the revised version of our manuscript, your very constructive comments have been incorporated into the revision.

In the following, black indicates the comments by the editor; blue is our response to the reviewer; and **note that all changes are highlighted by red in the manuscript.**

- (1) Following is the revisions and response to a few comments that the reviewer pointed out:
- (2) I think the structure of the Introduction should be improved. Paragraphs with info on the biological processes should be following each other and the same holds for those treating physical processes.
Thank you for your comments. The structure of introduction has been reorganized as follows with paragraphs relating to biological processes mentioned first and (now the first 3 paragraphs) followed by the physical processes.
- (3) Please write units with negative exponents throughout the manuscript, e.g. $m s^{-1}$
We have read through the entire manuscript changed nits to negative exponents.
- (4) Language use is sloppy. In many cases, part of which I indicate below, the sentences are not logical and carry syntax errors. Please go through the text.
Thank you for the comments. We have read through the entire manuscript, modified the parts you have indicated and made additional changes.
- (5) P3, L5 1953 (not 1985)
Corrected.
- (6) P3, L7-8 “ Seasonal cycles of phytoplankton concentrations signify the annual growth activity in pelagic systems” Is this a correct sentence? In particular the word “signify” seems strange here.
The sentence has been corrected as follows:
Seasonal cycles of phytoplankton concentrations are identifiable signals of the annual growth activity in pelagic systems (Cebrián and Valiela, 1999; Winder and Cloern, 2010).
- (7) P3, L9 “The most common cycle is the spring bloom ...” This is incorrect. A spring bloom cannot be a cycle. Please change wording.
The sentence has been corrected as follows:
In many parts of the world a spring bloom—an increase in phytoplankton concentrations in response to seasonal changes in temperature and solar radiation—is common and is usually present for a few weeks to months...

- (8) P3, L11 Often a secondary peak in production develops ... (add “in production” because the reader wouldn’t know what kind of peak is meant.
Added.
- (9) P3, L39 insert “during” after Sv
Corrected.
- (10) P4, L14, 19 m s⁻¹ (format with negative exponent)
Corrected.
- (11) P4, L16-17 “Local sea breezes, superimposed on synoptic southerly winds (with speeds often >15 m/s), are prevalent in austral summer and spring (Pattiaratchi et al., 1997).” Delete this sentence. Exactly this info was given in lines 13-14
The whole sentence has been deleted.
- (12) P4, L17-18 Change to: Storm systems in winter are associated ... (As it is in the manuscript, it is again repeating the info above)
Corrected
- (13) P4, L19 delete “storm”
Deleted
- (14) P4, L20-21 Storms cannot have winds. Please change, for example: In the study region a typical pattern in winter is strong north/north-easterly winds blowing for 12 to 52 hours,
The whole sentence has been changed:
In the study region winter storms have a typical pattern with strong north/north-easterly components blowing for 12 to 52 hours,
- (15) P4, L22-23 Dito: “Summer storms have southerly winds over a period of 3-4 days ...” Storms cannot have winds. Change to: Summer storms are southerly over a period of 3-4-days ...
The whole sentence has been changed:
Summer storms are southerly over a period of 3-4- days ...
- (16) P4, L24-25 This is a strange sentence. Above it was written that winds are high in winter, and here that there are calm conditions. Please change, for example: Calm conditions (<5 m s⁻¹) are observed between winter storm fronts during autumn and winter (March-August).
Thank you for your comments. The whole sentence has been changed as follows:
Calm conditions (<5 m s⁻¹) are observed between winter storm fronts during autumn and winter (March-August).
- (17) P5, L34-36 “Understanding ... shelf.” This is repeated info from lines 30-32

The whole sentence has been deleted.

(18) P6, L20-21 delete “Teledyne Webb Research Slocum Electric” (repeated info from above)
Deleted

(19) P6, L38 Please define QA/QC
QA/QC has been defined as Quality Assurance and Quality Control (QA/QC)

(20) P7, L4 please use “°C” not °Celsius
Corrected.

(21) P7, L11 “errors” instead of “faults”
Corrected.

(22) P7, L14 delete “after”
Deleted.

(23) P7, L24 delete “ensure ongoing reliability”
Deleted.

(24) P8, L13-14 “Summer storms, which usually lasted 36 hours, caused strong, southerly winds (> 25 m/s)” Storms cannot cause winds. Please change wording.

The whole sentence has been changed as follows:

Summer storms, which were usually associated with southerly winds, lasted up to 36 hours with speeds > 25 ms⁻¹).

(25) P8, L33 “at lower depths” It is not clear to me which depths are meant here. Do you mean greater depths further offshore? Please make clear.

The whole sentence has been changed as follows:

On the upper continental shelf (< 40 m depth), the inshore waters were cooler and less saline than the offshore waters (Figure 4a).

(26) P8, L36 delete “layer”
“layer” has been deleted.

(27) P9, L3 delete “depth”
“depth” has been deleted.

(28) P9, L32 I think “monthly mean water masses” is not the correct expression. What you mean is Monthly mean temperature and salinity (which describe water masses)

(29) Corrected.

(30) P9, L33 delete “year round,” If there are 4 from 12 exceptions, year round is not appropriate.

“year round,” has been deleted.

(31) P9, L35 “indicated” instead of “showed”?

“showed” has been changed to “indicated”.

(32) P9, L36 “were warmer” than what?

The sentence has been changed as follows:

the inshore waters (< 40m depth) increased (~21.1–23.0°C).

(33) P9, §3.3 Please indicate for what regions and their boundaries and depth ranges the monthly means were calculated.

Inshore and offshore region has been defined as follows:

The inshore waters were defined as region where depth < 40m, and offshore waters were defined as region where depth >40m.

(34) P10, L5 Please refer to Fig. 5

Figure number added as follows:

...revealed significant seasonal variability (Figure 5a).

...and lowest in February (minimum of 0.43 mgm⁻³, Figure 5b).

(35) P10, L12 and further. In Figs 6, 7 and 8 the anomalies are shown against the seasonal average. The sections in the 4 seasons do not have the same spatial extent. How does that influence the seasonal average and its anomalies?

It has no influence as the anomalies were based on the mean (see Table 1) and as such it does not depend on the length of the sections.

(36) P10, L19-20 “During spring, the temperature anomaly indicated that water to be vertically well mixed on the continental shelf (Figure 6a) with warmer water offshore” I think this conclusion is not allowed from this figure. The figure only says that the anomaly is not big on the shelf. Theoretically it is possible to have a stratified water column on the shelf, which is present during all seasons, and then the anomaly would also be small. Whether the water column is well mixed should be concluded from single sections. Second, are you writing here that the water on the continental shelf be mixed with warmer water offshore? The sentence is not unambiguous.

We agree and have modified the sentence by also relating it to the absolute values now presented as supplementary figures. They indicate the structure better.

During spring, the temperature distribution indicated that water to be vertically well mixed on the upper continental shelf (Figures 6a; S1a) and vertically stratified in depths >40 m. The offshore water in the upper layer was warmer compared to those on the inner shelf.

(37) P11, L7 “This SCM was associated with the temperature and salinity distribution” This is not clear. Please write how it was associated

A subsurface chlorophyll maximum (SCM) at ~100 m depth was present in the offshore

waters aligned with the vertical stratification in temperature and salinity and density (Figures 6a,7a; S4b).

- (38) P11, L16 concentration
changed “concentrations” to “concentration”.
- (39) P11, L19-20 delete “The data highlights the interannual variability.” (repeated info)
The sentence has been deleted.
- (40) P12, L22-23 “The water column was vertically stratified because of the presence of a DSWC on the upper shelf and a thermocline in the offshore waters ...” This sentence says the water column was stratified because of a thermocline. This is circular reasoning. Please modify.
Sentence changed:
The water column was vertically stratified across the whole transect with a DSWC present on the upper shelf (Figures 12a,b). Higher chlorophyll water was present in the DSWC’s bottom layer. In the deeper waters, the higher chlorophyll water was associated with the SCM (Figures 12m, n).
- (41) P12, L27-28 The winds were initially southerly and then changed to westerly and continued to be that way to 23 April ... (add “continued to be that way”, because I think this is what you mean; if you do not add that, you just say that the winds continued to 23 April)
Thank you for your comments.
“...continued to be that way” has been added.
- (42) P12, L28-30 “On the upper shelf, the DSWC was eroded such that by 25 April, the temperature and salinity were vertically mixed in the water column (Figures 12e, k).” Which temperature and salinity? You cannot mix temperature and salinity, only water can be mixed.
The whole sentence has been changed as follows:
By 25 April, the water column on upper shelf was vertically mixed (Figures 12e, k).
- (43) P12, L30-31 “the salinity on the upper shelf was vertically stratified” Only the water column can be stratified.
The whole sentence has been changed as follows:
On 28 April, when the winds decreased, the water column on the upper shelf was vertically stratified in salinity (Figure 12l).
- (44) P14 I think the first paragraph of the Discussion can be shortened significantly without losing information.
Thank you for your comments. We agree the Discussion can be shortened, and following sentences has been deleted.
We have deleted several sentences.

- (45) P14, L5 (relatively high costs, and ...
“high” has been added.
- (46) P14, L6 seasonal
season has been corrected to seasonal.
- (47) P14, L8 insert “layers” after sub-surface
“Layers” has been added – “in the sub-surface layers is unknown”.
- (48) P14, L11 Please avoid using “In this paper” again
“In this paper” has been changed to “Here”.
- (49) P14, L15 insert “also” after have
“also” has been added.
- (50) P14, L31 “the river discharge is mainly deflected south in winter” Is there a reference for this contention?
Reference has been added.
- (51) P14, L38 “whilst the salinity increased” From which value are time it increased?
The sentence has been changes as follows:
whilst the salinity increased from January to March
- (52) P14, L40 “due to heat loss to the atmosphere” instead of “due to atmospheric heat loss”?
“due to atmospheric heat loss” has been changed to “due to heat loss to the atmosphere”
- (53) P15, L35 ... seasonality like in other regions ...
The sentence has been changed as follows:
seasonality like in other regions globally
- (54) P16, L4 “Thus” instead of “This”
“This” has changed to “Thus”.
- (55) P16, L5 insert comma after “this” for enhancing readability
Comma has been inserted.
- (56) P16, L15 “highlighted” not “lighted”
Corrected to “highlighted”.
- (57) P17, L6-7 “Local and basin-scale ocean forcing affected the coastal hydrography (temperature and salinity) and biological variables (chlorophyll).” This is repeated info and can be deleted at this place.

The whole sentence has been deleted.

- (58) P17, L16-24 Info in this paragraph appears verbatim in the Introduction. Please modify and shorten and avoid duplication.

We agree. And the whole sentence has been changed:

This event increased the Leeuwin current's volume transport in February and caused high sea surface temperature anomalies (~5 °C higher than normal; Feng et al., 2013).

- (59) P17-18, L34-2 This paragraph contains much info, about biological aspects, that is not relevant for the manuscript. Please delete or shorten strongly.

We agree. Changes has been made as follows:

First sentence: The extended impacts of the heat wave have significant ecological impact, causing temperate reef communities in Western Australia (Wernberg et al., 2016).

“Here the marine heat waves forced the contraction of a ... and tropical waters.” has been deleted.

- (60) P18, L4-5 delete ”was used to study the seasonal and interannual variability across the Rottnest continental shelf and”. The sentence as it is in the text is awkward.

”was used to study the seasonal and interannual variability across the Rottnest continental shelf and” has been deleted.

- (61) P18, L7 delete “(DSWC)” (this has been defined before)

“(DSWC)” has been deleted.

- (62) P18, L8 delete “(ENSO)” (this has been defined before)

“(ENSO)” has been deleted.

- (63) The Conclusions section is mainly a summary. It is clear that some summing up will likely be needed in the Conclusions section, but I think here it is too much. The sentence towards the end of the section “It is concluded that the observed seasonal and interannual variability in chlorophyll concentrations were related to the changes in physical forcing.” Is the first concluding remark. However, it is trivial. Please restructure the whole section, so that both summary and real conclusions are in balance.

The conclusions section has been re-written with the conclusions separated into dot points:

A seven-year, high-resolution ocean glider dataset indicated that the temperature, salinity, and chlorophyll a distribution along the Rottnest continental shelf exhibited strong seasonal and interannual variability. Based on the results of the data analysis the following conclusions were reached:

- The seasonal variability was controlled by changes in the physical forcing that included winds,

formation of dense shelf water cascades and strength of the Leeuwin Current. The chlorophyll concentrations were higher during autumn and winter across the whole transect.

Inner continental shelf (< 50 m):

- During spring and summer months, the water column was vertically well mixed due to strong wind mixing. In autumn and winter, DSWCs were the main physical feature.
- Chlorophyll concentrations were higher closer to the sea bed than at the surface during spring, summer, and autumn. In winter the chlorophyll concentrations were uniform through the water column.

Outer continental shelf (> 50 m):

- During spring and summer months the water column was vertically stratified in temperature that contributed to the formation of a subsurface chlorophyll maximum (SCM).
 - With the onset of storms in autumn, the water column was well mixed with the SCM absent.
- Inter-annual variation was associated with ENSO events. Lower temperatures, higher salinity, and higher chlorophyll concentrations were associated with the El Niño event in 2010. During the strong La Niña event in 2011, temperatures increased and salinity and chlorophyll concentrations decreased. Over subsequent years, the temperatures gradually decreased, the salinity increased, and the chlorophyll concentrations continued to decrease. In autumn of 2014, the chlorophyll concentrations increased.

(64) Table 1 °C, not °Celsius

°Celsius has been changed to °C

(65) Figure 2 I am not sure everything in the wind roses will be readable. Please could you increase the fonts?

The font size has been increased.

(66) References

Below there are some examples of incomplete references. Please go through the reference list for other possible errors.

Feng, 2003 should be:

Feng, M., G. Meyers, A. Pearce, and S. Wijffels (2003), Annual and interannual variations of the Leeuwin Current at 32°S, *J. Geophys. Res.*, 108, 3355, doi:10.1029/2002JC001763, C11.

Field et al pages 237-240

Kilpatrick et al: Journal of Geophysical Research: Oceans, 123, 7550–7563.

<https://doi.org/10.1029/2018JC014248>

Pattiaratchi, C. and Buchan, S: Reference is incomplete

We have gone through the whole references, and made several corrections in addition to your comments.