

We would like to thank the reviewer for the comments. The [point-to-point responses \(in blue\) to the reviewers' comments](#) are listed below, and [the revised texts are displayed in red](#).

## Reviewer 2

1. They attributed the observed ANCP decrease between 2012-13 and 2013-14 to the changes in gross primary production, by the process of elimination. However, there is no direct evidence in the present manuscript that the estimated decrease of gross primary production is caused by the low plankton biomass observed in 2013-14. Plankton biomass may regulate production rate, but this does not necessarily mean reduction of ANCP. In principle, ANCP is regulated by annual availability of limitation factor, likely iron in the case of OSP. If the amount of available iron had been same in each year, low plankton biomass in 2013-2014 would have diminished rate of primary production, but that simultaneously enhanced duration of high-production period by postponing the timing of iron exhaustion, and integrated amount of gross primary production would become just same amount. This is always true, as long as both iron availability and biological stoichiometry (Fe: O : C) are same. If the authors want to link observed low plankton biomass in 2013-14 and estimated low ANCP at that time, therefore, they need to prove that 1) there is no significant difference in iron availability during the observation period, and 2) there may be significant plankton-dependency in Fe:O:C stoichiometry.

[Thanks for the comment. In this manuscript, we analyzed the connections between ANCP decrease and the high temperature anomaly \(the “blob”\) in the context of multiple physical and biological processes. Our analysis showed that the sharp decreasing trend of ANCP in 2013-14 has strong connections with the phytoplankton community composition change and low plankton biomass during the same period. The changes in phytoplankton community composition and biomass could be ultimately in response to the lack of micronutrients like iron due to the enhanced stratification during the “blob”, but unfortunately we do not have iron data available to confirm that.](#)

[We have revised the text in the discussion as follows:](#)

[“These changes in phytoplankton community composition could be ultimately in response to the lack of micronutrients like iron \(due to enhanced stratification from the “blob” that restricted the vertical supply\), which has been shown to regulate phytoplankton biomass and composition in this high-nutrient low-chlorophyll region \(e.g. Hamme et al., 2010; Marchetti et al., 2006\), . Unfortunately, we do not have iron data available to confirm that at this time. ”](#)

2. The model used in this paper is only effective when there is no change of water mass during the calculation period. However, significant increase of water temperature at the emergence of the Blob implies the readers that there may be some intrusion of warm water. As not all readers are familiar with

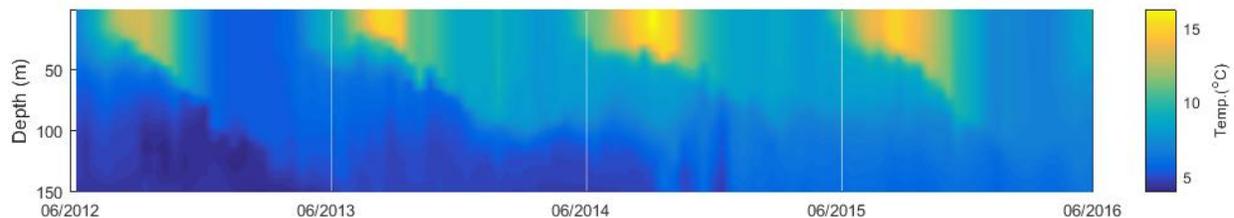
the physics of the Blob, the authors should mention briefly about that and declare continuity of water mass during the study period.

We adopted the reviewer's suggestion, and revised the text in Section 2.1.1 and supplemental materials as follows:

In section 2.1.1:

Furthermore, the temperature time series measured by the SOS-Argo (Figure S1) shows no significant intrusions of fronts/eddies, and the continuity of water mass during the study period also allows us to use this simplified model that ignores horizontal processes.

In supplemental materials:



**Figure S1** Upper temperature evolution measured by the SOS-Argo float at OSP, which shows the continuity of water mass during the study period (2012-2016).

3. The authors raised several possible cause about the discrepancy between oxygen based ANCP and that based on DIC, but none was mentioned about the inter-annual variation of POC/PIC production ratio that can make such discrepancy. Although we can understand from Figure 5 that no significant bloom of coccolithophore during the observation period, the authors should clearly mention about this in the text.

We adopted the reviewer's suggestion, and revised the text in Section 4.1 as follows:

Alternatively, the production ratio of particulate organic carbon (POC) and particulate inorganic carbon (PIC) may cause the inter-annual variation of DIC mass balance. However, in our case since there was no significant bloom of haptophytes (e.g. coccolithophore) during the

study period (Figure 5c), it is unlikely that the inter-annual change in POC/PIC ratio would affect the ANCP result calculated from DIC mass balance.