

Interactive comment on “Subsurface primary production in the western subtropical North Pacific as evidence of large diapycnal diffusivity associated with the Subtropical Mode Water” by C. Sukigara et al.

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To referee #3,

Thank you for your comment concerning the above manuscript entitled “Subsurface primary production in the western subtropical North Pacific as evidence of large diapycnal diffusivity associated with the Subtropical Mode Water” which we submitted for publication in Ocean Science.

We are very pleased to learn that our manuscript is acceptable for publication in Ocean

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Science with minor revision. Also, we have studied your comment very carefully.

As you commented, our conclusion was based on the indirect comparison depending on regression derived from HOT and poorly known f -ratio. With encouraged by your suggestion to use the oxygen data more effectively, we will take a completely different approach with greater use of the time-series oxygen data of our float in the revised manuscript to be submitted to Ocean Science. The new method to estimate the vertical diffusivity based on the oxygen profile time series is described in the reply to referee #1. A key feature of the method is to estimate downward oxygen flux based on considerably smaller DO decrease rate in the layer immediately below the subsurface oxygen maximum (SOM) layer compared to that in the layer further below, which we interpret as the result of downward diffusive oxygen flux from the SOM layer. We then estimate the vertical diffusivity based on this vertical flux and the vertical gradient of DO concentration obtained by the float. Please see the reply to referee #1 for more details. We believe this new approach gives more direct evidence to support the large vertical diffusivity. We thank you for encouraging us to make more effective use of the oxygen data.

Regarding the first part of the minor comment, the reason why we emphasize the float tracked the same anticyclonic eddy is that this feature indicates that the float followed much the same water column and thus that the temporal variations captured by the float should be dominated by vertical processes. We will add this explanation in revised manuscript. Regarding the comment on the multiplication of depth by 1.4, this may have been a too simple way to adjust the relationship derived based on the HOT data to the situation in the western subtropical North Pacific. We won't estimate NPP based on the HOT data and thus won't employ this multiplication in the revised manuscript. Concerning to the other minor comment, we will rectify the text according to your comment.

We found your comments most helpful. We hope revise manuscript will acceptable for publication.

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Yours sincerely,

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