

Reviewer 2:

This manuscript provides the global map of the subsurface chlorophyll-a (Chl-a) maximum based on in-situ data. In previous studies, the global map of the subsurface Chl-a maximum is estimated from surface chlorophyll distribution (Mignot et al., 2014), and therefore the map obtained in the paper is valuable to the oceanographic community. The manuscript also reveals seasonal oxygen increases below the mixed layer and the variation of subsurface chlorophyll-a in the equatorial Pacific associated with ENSO. I think that the paper is acceptable for publication after minor revision.

We appreciate the acceptance of the potential value of the paper and helpful comments from the reviewer. Referring to all the comments, we carefully revised the manuscript. Point-by-point responses to the reviewer's comments are given below.

Line 133-135, Line 180-183

The authors state that the Chl-a maxima are often contaminated with the subsurface fluorescence maximum. To me, this seems like an extreme view. If the vertical distribution of fluorescence observed in a mixed layer does not necessarily correspond to that of Chl-a, the significance of measuring fluorescence data in a mixed layer is greatly reduced. Biermann et al. (2015) referred by authors describe the effect of the correction of the fluorescence data but do not seem to describe the difference between fluorescence data and Chl-a data.

Considering the reviewer's comment, we checked the maximum from each data source. The area averaged Chl-a concentration and the subsurface Chl-a maximum show similar seasonal cycle both in data from bottle samples and in data from profiling floats. In the Southern Ocean, the subarctic North Atlantic, and the subarctic North Pacific, the subsurface Chl-a maximum within the mixed layer depth in winter can be seen even in the bottle samples although the depth of Chl-a maximum is slightly shallower in data from bottle samples than in those from profiling floats. Therefore, the subsurface maximum within the mixed layer depth is not necessarily just the fluorescence maximum but the substantial Chl-a maximum. This indicates that the subsurface Chl-a maximum is a general feature of the ocean even in areas with a deep mixed layer in winter.

We have added the description about the Chl-a maximum within the mixed layer depth

(Lines 204-213), and the figure of seasonal evolution of Chl-a concentration using data only from bottle samples and profiling floats as Figures S3 and S4.

Line 234-236

The authors mention that the maps for subsurface Chl-a would be useful to validate ocean biogeochemical and Earth system models. I agree with this opinion. I recommend that the authors publish the data on the subsurface Chl-a maximum depth (Fig. 1a) at a public data repository such as Figshare.

Following the reviewer's suggestion, we will publish the data on the subsurface Chl-a maximum depth at <http://caos.sakura.ne.jp/sao/scm/>.

Line 126-127

Does the calculation of euphotic layer depth take into account the light shading effect of phytoplankton? If the shading effect is considered, I can understand the sentence (North of ...).

In the revised manuscript, since we used the photosynthetically active layer instead of the euphotic layer, this sentence was deleted.