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Ocean Science Discussions

Interactive comment on "High-resolution physical-biogeochemical structure of a filament and an eddy of upwelled water off Northwest Africa" *by* W.-J. von Appen et al.

W.-J. von Appen et al.

wjvappen@awi.de

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We thank the reviewer for their very positive general assessment of the paper and for the specific suggestions that improved the quality of the paper.

Please note that we also added an additional piece of information in section 2 (old line 96) on the technical setup which we had forgotten before: "The Triaxus flew a so-called saw-tooth pattern (Figure 1a) and was slightly deflected to the side by yaw flaps so as not to measure in the ship's wake."

Comment:

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Line 217 "VMADCP and the WaMoS radar (green/magenta in Figure 2b) agree well with the geostrophic flow" This is actually not the case, they are significant differences in magnitudes and directions throughout the section. This should be discussed in more details for the different processes. Since WaMoS radar current observation is a promising method, a proper assessment against VMADCP is valuable.

Response:

We agree that VMADCP and WaMoS current data require a proper and documented comparison/assessment. In fact, two of the authors of the current manuscript were involved in exactly such an assessment based on data from the same cruise as presented here: Hessner, K., El Naggar, S., von Appen, W.-J., and Strass, V. H.: On the reliability of surface current measurements by X-band marine radar, Remote Sensing, 11, https://doi.org/10.3390/rs11091030, 2019. We had cited this paper which was published in early 2019 in the data section (old line 172), but had not mentioned its scope properly. We thank the reviewer for raising this point and address it by referring to Hessner et al on (old) line 217: “(We refer to Hessner et al. (2019) for a more complete assessment of the differences between WaMoS and VMADCP data; they document a good qualitative and quantitative agreement for all data from the same cruise as discussed here.)”

Comment:

Figure 2: A high resolution infrared and/or ocean color image should provide a much better synoptic view of the eddy and upwelling filament.

Response:

We had looked at this in the past, but due to cloud cover, there were no such high resolution data sets available within a few days of the transect. However, upon reexamining, we realized that the OCCCI chlorophyll concentration 8-day average from two weeks after our transect contains useful information which we agree adds useful context to

the paper. We have added this as a new Figure 3 and have added its data description and interpretation as follows:

(new) line 213: “The Ocean Colour Climate Change Initiative (OC-CCI) chlorophyll-a dataset, Version 3.1, of the European Space Agency (Sathyendranath et al., 2018) was downloaded from https://esa-oceancolour-cci.org. These are 8-day composites of merged sensor (MERIS, MODIS Aqua, SeaWiFS LAC and GAC, VIIRS) products.”

(new) line 243: “High resolution SST and chlorophyll concentration (from ocean color) data could provide a much better synoptic view of the (sub-)mesoscale features discussed in this paper. Those sensors are affected by cloud cover and therefore no such high resolution data is available in the study area within a few days of our 22.5 hour long transect. However, the average from 10- Jun-2018 to 17-Jun-2018 (Figure 3) which is approximately two weeks after the Triaxus transect contains sufficient information to be interpretable. The recently upwelled cold water near the coast is high in chlorophyll. The mesoscale filament providing the westward advection pathway is also associated with elevated chlorophyll concentrations. At the longitude of the transect, it has moved slightly southwards from approximately 20.9°N (e.g. Figures 4b/7d discussed below) to 20.4°N within the two weeks between the transect and the available satellite derived chlorophyll map (Figure 3). It is also clear that the two anti-cyclones (closed blue contours) are associated with very low chlorophyll concentrations.”

(new) Figure 3 caption: “Map of satellite based chlorophyll concentration [μ/l; OC-CCI v3.1 product] as color with sea level anomaly [m; SSALTO/DUACS SSH L4] as blue contours. The chlorophyll is an 8-day average centered on 13-Jun-2018 12:00 UTC and the SLA is a 7-day average centered on 13-Jun-2018 00:00 UTC, i.e. approximately two weeks after the Triaxus tow. The ship track and the westward advection pathway are plotted as in Figure 2.”

Addition to acknowledgements: “We thank ESA for OC-CCI chlorophyll, Copernicus Marine Environmental Monitoring Services (CMEMS) for SLA and NOAA for SST data.”

Comment:

Line 270: "This large scale (order of 50 km) coherent flow structure" - this is of the order of the Rossby radius (40-50 km) so this is not large scale, but mesoscale.

Response:

Yes, we agree and replaced “large scale” with “mesoscale”.

Comment:

Line 322: "filament that came from the west" rather from the east, doesn’t it ?

Response:

Yes. Thanks for catching our typo. Replaced “west” with “east”.

Comment:

Line 345 "envrionmental"

Response:

Typo corrected.

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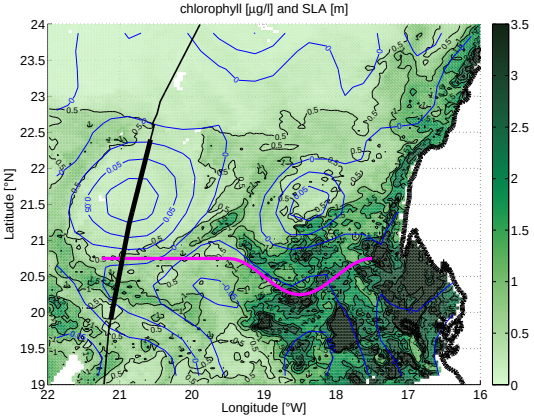

Fig. 1. Added figure in response to comment by reviewer #1

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