

## ***Interactive comment on “Mesoscale contribution to the long-range offshore transport of organic carbon from the Canary Upwelling System to the open North Atlantic” by Elisa Lovecchio et al.***

### **Anonymous Referee #3**

Received and published: 17 April 2018

#### GENERAL STATEMENT

This is a numerical modelling study of the relative contribution of mesoscale structures such as upwelling filaments and eddies to the export of biogenic organic carbon from the NW Africa EBUE to the adjacent ocean. The work is very opportune in the current context of revisiting the biological pump to assess the importance of the horizontal fluxes of dissolved and suspended organic matter in ocean margins in general, and EBUEs in particular. The paper is solid, showing the limitations of the ROMS + NPZD coupled models honestly and applying appropriate methodologies (Reynolds flux decomposition and structure-identification algorithms) to separate the transport from fila-

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ments and eddies. It is well written and understandable for scientist interested in this issue that are not modellers, as it is my case. The results are relevant, confirming the major role of filaments in the first few hundred kilometers off the coast and the rising importance of eddies further offshore. Therefore, I do not have any major concern about the manuscript.

However, I would also like to introduce a philosophical issue. The NPZD has difficulties to reproduce properly the C cycle in coastal upwelling zones for two reasons: i) DOC is not properly included in the model; and ii) benthic nutrient mineralisation is not considered.

For the case of DOC, the authors have found a way to overcome the problem by introducing two POM pools (sinking and suspended) and considering DOC part of the suspended POC pool. It could work. In this regard, lateral Corg fluxes are reported without differentiating the pools considered (Phyto, Zoo, large POM, small POM + DOM). Are you reporting only small POM + DOM or also the other pools?

For the case of benthic mineralization, in EBUEs with wide continental shelves, as it the case of the NW Africa EBUE, 40-60% of the nutrients used for phytoplankton growth could come from the underlying sediments. Is this process included in the NPZD model in any way?

#### SPECIFIC COMMENTS & MINOR DETAILS

Page 1, line 4 – I would not say that a model will be able to “demonstrate quantitatively” that eddies and filaments are exporting organic matter from the coast to the open ocean at the NW Africa EBUE scale. A numerical model is a tool that tries to approach as much as possible to reality, but it is (rather) imperfect.

Page 5, caption of Figure 1 – explain what is “01/12/0030” and change “9.5°N and 32°N” by “32°N and 9.5°N”.

Page 7, line 13 – salinity is unit less

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Page 9, line 1 – It is a bit optimistic to state that the patterns of the model and the observations are “very similar”. I would say just “similar” or even “roughly similar”.

Page 11, line 2 – Please, erase “found”

Page 11, line 18 – Please, indicate what organic matter pools are included in Corg (Phyto?, Zoo?, large POM?, small POM + DOM?).

Page 12, Figure 5 – Why Corg was integrated through the entire water column instead of just in the upper 100 m. No scale for current vectors has been added in panel (a).

Page 20, Figure 12 – The footnote is not coherent with the figure.

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