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Interactive comment on "Interannual variability of the Mediterranean trophic regimes from ocean color satellites" *by* N. Mayot et al.

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The present study by Mayot et al. builds on a previous work (D'Ortenzio and Ribera d'Alcala, 2009) that used the phytoplankton climatological seasonal variability, based on multi-year Chl-a satellite data, to identify different "bioregions" or "trophic regimes" in the Mediterranean using clustering analysis. In this work, a method is proposed to identify new "anomalous" regimes, statistically different from the previous "climatological" on an annual basis, which are then regrouped again using K-means clustering. The inter-annual variability of the Mediterranean "bioregions" over 16 years of available ocean color data is investigated. The analysis shows the dominance of previously identified trophic regimes, attributing the "anomalous" regimes to special events. The inter-annual variability in the trophic regimes is linked to the variability of the forcing

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in different regions, which is clearer in some cases (deep convention, Atlantic water inflow), while offering some insight in other cases where the mechanisms are less apparent. The methodology appears robust, even though some points are not totally transparent (see specific comments 3-5) and some more details are needed to help the reader. There is a comprehensive analysis of the results with adequate reasoning and well supported conclusions. I therefore recommend the publication of the manuscript after minor revision. More specific comments and some typos/grammar corrections are listed below.

Specific comments

1) In Page 14946 (Line 6) you mention that the Chl-a time-series were normalized in order to minimize the impact of the satellite algorithm artifacts. Unless I'm missing something, It seems that since in your (clustering/time series) analysis you are interested in chl-a differences between different areas, using the absolute Chl-a would probably give the same results. The Chl-a normalization is very useful however in order to plot different areas on the same scale and probably also to remove any difference (in terms of bias) of the two satellite datasets. If this is the case, I suggest you rephrase your reasoning for normalizing Chl-a.

2) Please provide some reference for the "Chebyshev distance" (P14946, L22).

3) It is not totally clear (also in DR09) how you do the clustering from the annual time-series. From the dataset tables in Fig.1 it seems that you use the different 8-day Chl-a averages (w1-w46) as different "variables" in the clustering. If this is case or some other method (e.g taking some properties of the time series as "variables") is used, please describe this explicitly in the methods section.

4) Step 5 (section 2.2 and Fig.1) also is not totally clear. You mention "from all 16 years combined". How does this works? You put all the years of an "anomalous" pixel one below the other, as implied by the table in Fig.1 (e.g having 2000 below 1999 etc). This is slightly different from the clustering in DR09. Does this affects the procedure since

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there is the case that in one year a pixel is “anomalous” and in another is based on DR09? Please expand your description in methods to make this clearer for a reader not (necessarily) familiar with clustering techniques.

5) You mention (P14948, L5) that Fig.3 represents “16 annual maps of the spatial distribution of the 11 trophic regimes”. How are these annual maps generated? Do you follow the same procedure (as in step4, section 2.2), comparing each pixel annual time-series with the time-series of the clusters (DR09+anomalous)? Please explain in the text. Perhaps it would be also useful, in terms of methodology, to discuss how these maps would be different with the maps based on performing clustering on each year separately.

6) It would be useful to provide in Table 1 also the absolute Chl-a values (e.g in parenthesis after the normalized values) to permit a rough comparison between different clusters in terms of productivity. For example, is No_Bloom1 that is permanently observed in the Levantine the most "oligotrophic"?

7) By “minimum rate of change” (e.g P14948, L25) I guess you mean negative values, describing a stronger decrease. You can add a note in the text to make this more apparent.

8) P14949, L2 “The maximum value of the “Coastal #6” time series is lower (0.72 nChl)”. Is this correct? It appears lower in the figure while 0.72 is higher than 0.66 of Bloom#5.

9) P14950, L12 “but a higher amplitude of [Chl]surf (0.48mgmôĂĂĂ3 for the “Anomalous #4” and 0.25 for the “No Bloom #3”)”.

Not sure what you mean here. Please check.

10) P14957, L1: “The bimodal pattern”

Not sure what you mean here with bimodal

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11) P14958, L13: With regard to the influence of the Black Sea Water, You could also refer to Petihakis et al. (2015).

12) P14962, L15 “the new approach had permitted to demonstrate that when the 16 years are considered separately, the patterns in the seasonality of the phytoplankton described by DR09 (except the “Coastal #7” trophic regimes) were always recovered.”

Not sure what you mean by “considered separately” in this context.

13)P14960, L2 “..more than the deep convection events, the permanent cyclonic circulation in this region was the primary factor inducing favorable conditions for phytoplankton bloom, by bringing the nitracline depths close to surface. Relatively shallow mixed layers.. ”

Usually deep convection sites are found in areas with cyclonic circulation due to the dome shape of the density that favours deep mixing and I think the phytoplankton bloom mechanism is mostly related to the vertical mixing. Therefore, the “relatively shallow mixed layers” might be misleading. I suggest you rephrase this.

Technical corrections

Page 14943, Line 3 & Line 8: Replace “dynamic” with “dynamics”

Page 14943, Line 5 : Replace “that kind” with “those kind“

Page 14943, Line 6 : Replace “impact on the” with “impact the“

Page 14943, Line 21 : Replace “factors affecting ecosystem function” with “factors affecting the ecosystem functioning“

Page 14943, Line 22 : Rephrase “has been relatively under considered” with e.g “has received less consideration”

Page 14944, Line 17 : Replace “has been already used” with “has already been used” Replace “and of nitrate” with “and the nitrate”

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Page 14945, Line 20 : Replace “respectively 8 days and 9Km” with “9 Km and 8 days respectively”

Page 14947, Line 12 : Replace “from of all” with “from all”

Page 14950, Line 20 : Replace “We will discuss on this later” with “We will discuss this later”

Page 14955, Line 17 : “Similitude” You mean similarity?

Fig1: Replace “all years conbined” with “all years combined”

Page 14960, Line 23 : Replace “is confirmed as be strongly impacted” with ““is confirmed to be strongly impacted”

Page 14962, Line 8 : Replace “have been hide” with “have been hiden” or “have been masked”

Page 14962, Line 8 : Replace “artifactual regime produce” with “artifactual regime produced”

References

Petihakis, G., K. Tsiaras, G. Triantafyllou, S. Kalaroni and A. Pollani, 2015. Sensitivity of the N. Aegean Sea ecosystem to Black Sea Water inputs, Mediterranean Marine Science, 15/4, 790-804, doi:10.12681/mms.955.

Interactive comment on Biogeosciences Discuss., 12, 14941, 2015.