

Interactive comment on “Compound high temperature and low chlorophyll extremes in the ocean over the satellite period” by Natacha Le Grix et al.

Anonymous Referee #1

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General Comments This manuscript uses satellite data to identify events in the ocean that occur at extremes of both SST and chlorophyll, “compound” events. This is an emerging field of study, particularly for the ocean and is important for understanding how our planet is changing under global warming. The paper is well written and suitable for publication. I have some suggestions for improving the manuscript.

Specific Comments

There has been a lot of work done, dating back to the 1980s, on coral bleaching events, which are largely temperature driven. It might be outside the scope of this paper, but it could be interesting to see if there are any similarities between the global distribution

C1

and timing of coral bleaching events and the compound events described in this paper.

Avoid the use of terms like “high-resolution”, “high quality” and “high temporal-spatial coverage” as they are not quantitative terms (section 2.1). For example, they say the SST dataset they use is “high-resolution” but also state that it has a resolution of 0.25° , which these days is not considered a high-spatial resolution for a SST dataset, just the opposite, it would be considered a rather coarse resolution, given that there are products available at < 1 km spatial resolution. However, I realize that “high resolution” is part of the AVHRR acronym, so clearly the term needs to be used in that context. Similarly, they frequently refer to the 1998-2018 time period as being “short” (i.e., line 103, 299). Obviously, this is the longest record of satellite chl we have ever had. When these statements are made they need to clarify exactly how the 20 years of data is not sufficient, if that is indeed the case.

How do the chlorophyll results of the NASA Ocean Biogeochemical Model compare to the ESA OC-CCI product? I am more familiar with that product being used when there is a need for a dataset spanning across all OC sensors.

Technical Comments

Section 2.2.3 It is difficult to keep track of all of these climate indices as written here – it might be easier to digest if this information was presented in a table.

Figure 2. Why is just the time period 2013-2015 shown? And why this location?

Figure 4 & 5. Since the data shown in Figure 5 is very relevant to that shown in Figure 4, I wanted to be able to look at them side by side, which is difficult since they are on separate pages. Consider merging these together into one plot.

All Figures. Label the color bars with the variable shown and the units.

Section 3.3.1 The discussion in the first paragraph about the global scale distribution is hard to follow, especially since the data is not shown. My first thought was that there must be a difference in behavior between hemispheres, and I was wondering if

C2

they took that into account, and then that is brought up in the next paragraph with the discussion of Figure 7. I suggest removing the first paragraph entirely, and just focusing on the behavior as a function of latitude and day of year, which clearly shows that the MHWs are more prevalent in the winter (northern and southern).

Figure 10. It is impossible to distinguish between the four different colors of green, and the two different yellows. Is there even much difference in the distribution between the negative and positive phases? If there is it is impossible to tell on this figure. I suggest redoing with just 5 colors, one per index.

Be consistent in the use of acronyms. Acronyms are used for the climate modes in Figure 10, but in the text acronyms are not used. Same for LMF, acronym is defined but not always used.

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