Review: “Comparing Global Trends in Marine Cold Spells and Marine Heatwaves” by Robert Peal et al.

This manuscript presents statistics and trends of cold extreme events, namely Marine Cold Spells (MCS), using the high-resolution CMEMS OSTIA sea surface temperature product, which is a foundation SST product, that is free of diurnal variability. The authors present two case-studies to demonstrate the application of the MCS detection algorithm. Then global comparison between MCS and Marine Heatwaves (MHW) statistics including trends is presented.

Ocean temperature extreme events, in particular MHWs, have received a lot of research attention over the past years, mainly due to their potentially devastating impacts on marine ecosystems as well as socio-economic impacts, through e.g. fisheries.

While the manuscript is logically structured, I have concerns as to the novelty of the results presented and recommend to re-consider publication of this manuscript after major revisions. Detailed comments are listed below.

Main comments

The authors claim that they are the first study to examine trends MCS and additionally comparing these to trends in MHWs. This is not true, as this study https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2021GL097002, published in March 2022, does exactly that and the results presented by Peal et al in Fig.2 and 3 are basically identical with Fig.1 and Fig.2 in Wang et al., 2022. The authors of the submitted manuscript do not cite this publication, which is a major flaw. I therefore recommend that the authors have to revise their manuscript significantly to demonstrate the novelty (if there is any) of their results.

Furthermore, the authors mention that one novelty is using the CMEMS OSTIA dataset instead of OISST. While I see some value in comparing results using different datasets, I feel like the authors should then use chance to provide more quantitative details into the differences, e.g. what actual difference does it make for MHW/MCS statistics when I used OISST vs. OSTIA? How does this differ from region to region? This comes down to the drivers of the events, where do I really need such high resolution and where is 0.25° sufficient? Does OSTIA provide better results in coastal regions or areas of high SST gradients, such as Western Boundary Currents? Also the authors state that they are regridding OSTIA to 0.25° due to computational reasons. How does that affect the results? The authors could try to quantify this on a regional example if memory is an issue for the global dataset. I am not an R user but there should still be ways around these memory issues by e.g. applying the detection code on lat/lon chunks of the data. In addition, highlight the differences of using a bulk vs. a foundation product? How does that impact my MHW/MCS statistics?

If this manuscript is intended to be more of a report on the current state, the authors should better discuss outstanding issues, challenges and also highlight potential drivers in their discussion. A main part though is being up to date on existing literature.

Minor comments

There is little to no new insight provided as to the drivers of these events. If not through analyses, then the trend patterns should at least be discussed in the context of existing literature on temperature trends and their drivers.

Section 3.4. provides some new insights but is again lacking some interpretation.

Figures

Fig 3: Why use such a pale colormap? Panels e)-j) are very hard to see. The similar comment applies to Fig2 panels c) and d). I believe using a sequential colormap with more colors would help the readability of the figures.

Fig 4: I suggest making the lines a little thicker for better readability.

Line-based comments

L27: add 'can' after (MCSs), since not all events have devastating impacts

L42: same point as in L27. Change to for example 'These events often have dramatic…'

L47: Site https://www.science.org/doi/10.1126/science.abj3593 for socio-economic impacts. Change sentence to e.g. "… having socio-economic impacts (Smith et al., 2021) by e.g. altering fishery yields (Mills…)"

L78ff: Schlegel et al., 2021 should be clearly mention somewhere here.

L86: Why not use the term commonly used 'threshold'? The categories are then one,two,three,four times the threshold as also presented in Fig 1. This would seem more intuitive than presented here.

L93: Add that if there is a gap of less than two days between MHWs they are considered as one event.

L134ff: It would be more intuitive (from an oceanographer's point of view) to state at the beginning that Western Boundary Current regions show higher intensity and then list the regions.

L171-176: There are several ocean papers that discuss cooling trends over the Southern Ocean, these could be mentioned here to at least provide the reader with insights as to potential mechanisms behind these trends. Hence it is not surprising that Schlegel et al observe the same signal in their analysis.

L188/189: So is this attributable to the different datasets? Or something else?

L217/2018: Was there reason to believe that Schlegel's results strongly depend on the resolution of OISST? E.g. do important mechanisms that drive MCS occur on significantly smaller scales that could now be resolved with OSTIA? Is the most important difference of the dataset the resolution (even though OSTIA is also regridded) or the bulk vs. foundation temperature?