Dear Editor Dr. Manzella,

In reply to your decision on our manuscript which surprised us since no clear rejection was suggested by any of the two reviewers, in the following we would like to clarify some points. In particular, we would like to reply to your concerns. We are not trying here to address the reviewers’ comments which we consider very relevant and useful and that could certainly have helped to improve our original manuscript and increase the potential impacts of the data set.

Regarding your comment about the fact that the "paper is not fitting the ESSD requirements", first of all we are wondering why this concern did not come after the initial evaluation by the handling editor. In the ESSD Section “Interactive Review Process” we read “The handling editor evaluates whether the manuscript is within the scope of the journal and whether it meets basic scientific quality.” A decision at that early stage would have certainly avoided authors and reviewers’ waste of time.

Furthermore, as reported in the ESSD aims and scope webpage (https://www.earth-system-science-data.net/about/aims_and_scope.html) “Earth System Science Data (ESSD) is an international, interdisciplinary journal for the publication of articles on original research data (sets), furthering the reuse of high-quality data of benefit to Earth system sciences.” In our opinion the manuscript fits this aim. We proposed a MHWs dataset based on high-quality data, the ESA CCI SSTv2.1, which can potentially be used for many scientific applications. The SEWA-MHWs dataset is suitable for regional and coastal MHWs studies due to its high horizontal resolution, and the synergistic use of SEWA-MHWs dataset with other model outputs and observation data could help to fill the knowledge gaps about the drivers and the marine ecosystems impacts of these extreme events.

In particular, we are in disagreement with your argument about the fact that methodology applied to compute our dataset is not a “mature methodology approved by the scientific reference community”. As stated in the introduction and highlighted by the referee1, our approach is rooted in Hobday et al 2016 framework, which is, to our knowledge, the only method to identify MHWs still widely used by the scientific community. Hobday et al. (2016) were the first to propose a definition for MHWs, according to which the temperature must be higher than a given percentile (e.g., 90th, relevant to a reference climatology) and must persist for at least five days. This definition has been widely...
adopted by the oceanographic community (e.g., Holbrook et al., 2019, Oliver et al., 2021, Smale et al., 2019, Sen Gupta et al., 2020). However, by definition, MHW detection is characterised by flexibility in the choice of the set-up parameters (such as the climatology and the percentile threshold). We decided to consider a trend and time-varying seasonality in the baseline climatology estimation. Recent studies show that increases in both the mean SST and the variability of SST due to global warming can lead to increase in warm temperature extremes (Pierce et al., 2012), so that by the late twenty-first century most of the global ocean will reach a permanent MHW state (Oliver et al., 2018; Holbrook et al., 2020; Frölicher et al., 2018). Hooolbrook et al. 2020 and Oliver et al. 2021, in their recent review papers, have suggested that baselines should shift when analysing MHW events under climate change. Saying that, we can conclude that our methodology is perfectly in line with the scientific reference community. On top of that, we would also like to point out that both referees recognize that the methodology is certainly interesting for the community. Secondly, we also think that the in situ information are not necessary to evaluate our dataset. SEWA-MHWs dataset is based on ESA CCI SST data, which are, as reported in the Merchant et al 2019, already evaluated, adjusted and calibrated using in situ observations. Therefore, the uncertainties of our dataset reflect the uncertainties of the ESA CCI SST dataset. We could have provided a detailed description of them in the manuscript referring to Merchant et al. 2019. Nevertheless, it is worth mentioning that we attempted to evaluate our dataset on MHW macroevents in the only possible way, which is comparing our results with existing works in the literature. Lastly, the methodology is applied only to the Mediterranean, but it could be, in principle, applied to the global. Besides the fact that the method is too computational demanding to be applied globally, not all the datasets arise as global. We decided to focus on SEWA basins because they represent a well known "Hot Spot" region for climate change (Giorgi, 2006) which is seriously affecting marine biodiversity, especially in the Mediterranean sea (Juza et al., 2022). Moreover, the MHWs Mediterranean community is increasing constantly and new projects that could have benefited from our work have already started (e.g. CareHeat, https://eo4society.esa.int/projects/careheat/).

In addition, according to the ESSD Review criteria webpage (https://www.earth-system-science-data.net/peer_review/review_criteria.html), the data set presented by an article and the article itself has to meet the following criteria: significance, data quality and presentation quality. The significance criteria is divided into three sub-criteria: uniqueness, usefulness, completeness.

Since SEWA-MHWs is the first effort in literature in archiving extreme hot sea surface temperature macroevents, we think that the SEWA-MHWs dataset could be considered as unique. The advantages of the availability of a MHWs macroevents dataset are to avoid waste of computational and/or time resources to process SST data to detect MHWs.

The dataset can be considered useful as well, because, alone or in combination with other data sets, can be used in future interpretations, for the comparison to model output or to verify other experiments or observations. In particular, as stated before, it could help to fill the knowledge gaps about the drivers and the marine ecosystems impacts of these extreme events. For example, compound events have become of particular interest, i.e., when conditions are extreme for multiple potential ocean ecosystem stressors such as temperature and chlorophyll (Gruber et al., 2021, Le Grix et al., 2021). Moreover, our attempt to provide a complete dataset in a consistent framework would increase comparability among MHWs studies that will use SEWA-MHWs dataset and, on top of that, SEWA-MHWs dataset provides a ready-to-use dataset to be compared to other studies which apply different MHW definition, without waste of computational and/or time resources. Lastly, the SEWA-MHWs dataset can be considered complete. It covers the entire period of ESA CCI SST v2.1 and it covers one semi-closed basin and two closed basins. Regarding the data quality and the presentation quality, both referees enjoyed the reading and one of the referees states that the description of the dataset is appropriate
and the dataset is easy to download.

Nevertheless, as one of the referee pointed out, we are aware that the dataset has some limitations:

1) The dataset misses recent years. This is certainly true, but we could have overcome this problem keeping the dataset updated any time the ESA CCI SST are updated taking advantage of the ESSD Living Data Process (https://www.earth-system-science-data.net/living_data_process.html). Or we could have, during the review process, expanded the analysis using the data form 2017 to 2022 available in Copernicus CDS (https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-sea-surface-temperature?tab=overview). These data are produced at levels L3C and L4 on behalf of the Copernicus Climate Change Service (C3S) to extend the ESA CCI SST baseline. They are generated using software and algorithms developed as part of the ESA SST CCI.

2) The dataset is inevitably linked to a specific SST dataset. This is certainly true, but we think that it is an intrinsic characteristic of all the datasets that are produced from or reuse high-quality data. Inevitably, they depend on the data used to generate them. Nevertheless, even though the routines are computational and time demanding, we could have provided scripts to rerun the method on new SST dataset.

3) The reduced geographical boundaries limit the number of potential users. This is certainly true, as we reported above, not all the datasets arise as global and for this specific phenomenon the Mediterranean is an hot spot (Garrabou et al., 2009, Giorgi et al. 2006, Cramer et al., 2018, Pastor et al., 2020, see also news on international newspapers or websites e.g. https://www.lemonde.fr/en/environment/article/2022/07/30/marine-heat-waves-mean-deadly-fate-for-large-number-of-mediterranean-flora-and-fauna_5991965_114.html, https://www.esa.int/Applications/Observing_the_Earth/Mediterranean_Sea_hit_by_marine_heatwave, https://www.mercator-ocean.eu/actualites/marine-heatwaves-mediterranean-summer-2022/, https://www.reuters.com/business/cop/mediterranean-marine-heatwaves-threaten-coastal-livelihoods-2022-11-13/). Nevertheless, as stated before, we could have provided scripts to rerun the method over other regions.

REFERENCES:


Giorgi, F.: Climate change hot-spots, Geophysical research letters, 33, 2006.


