Point by point response (Review 2):

Review of 'Characterization of Marine Heat Waves in the IBI Region in 2022', by Lluís Castrillo-Acuña, Axel Alonso-Valle, Álvaro de Pascual-Collar.

Dear Anonymous referee #2,

We would like to thank you for your time dedicated into this contribution.

The paper studies the marine heat wave event that occurred in the IBI region in 2022, using satellite data, situ observations and modelling products. The paper is clear and the problem is remarkable, but the work requires some revisions.

In particular, the authors analysed satellite time series of SST covering the period from 1/9/1981 to 31/09/2022, so the time series does not cover the entire year 2022, the year selected by the authors to focus their analysis. Consequently, all statistics for 2022 are distorted by the absence of the last 3 months of data. The authors should revise the text and caption of figure 3 considering the incompleteness of the time series of the 2022 SST data (9 out of 12 months) or extend the analysis to cover the entire year 2022.

We use the data from January 1982, 1/9/1981 is the first date of available data at Copernicus website. We will extend the SST data covering the entire year 2022 having complete year data from 1982-2022.

The authors applied the Hobday method to detect the MHWs. This method identifies the marine heat wave event whenever the SST anomaly with respect to the baseline climatology exceeds the 90th percentile threshold for more than 5 days of minimum duration. The authors state that they calculated the climatology using the entire time series of SST data instead of the 30-year climatology as suggested by the Hobday and WMO. Since the method is very sensitive to the climatology used, it is necessary to provide a justification for this choice as the base climatology and to justify the implications of using a climatology calculated using a 40-year+1 month time series.

The baseline period for selecting the climatology has been discussed in the OSR coordination meetings. The conclusions regarding this issue for all the groups that will assess MHWs in the OSR8 where:

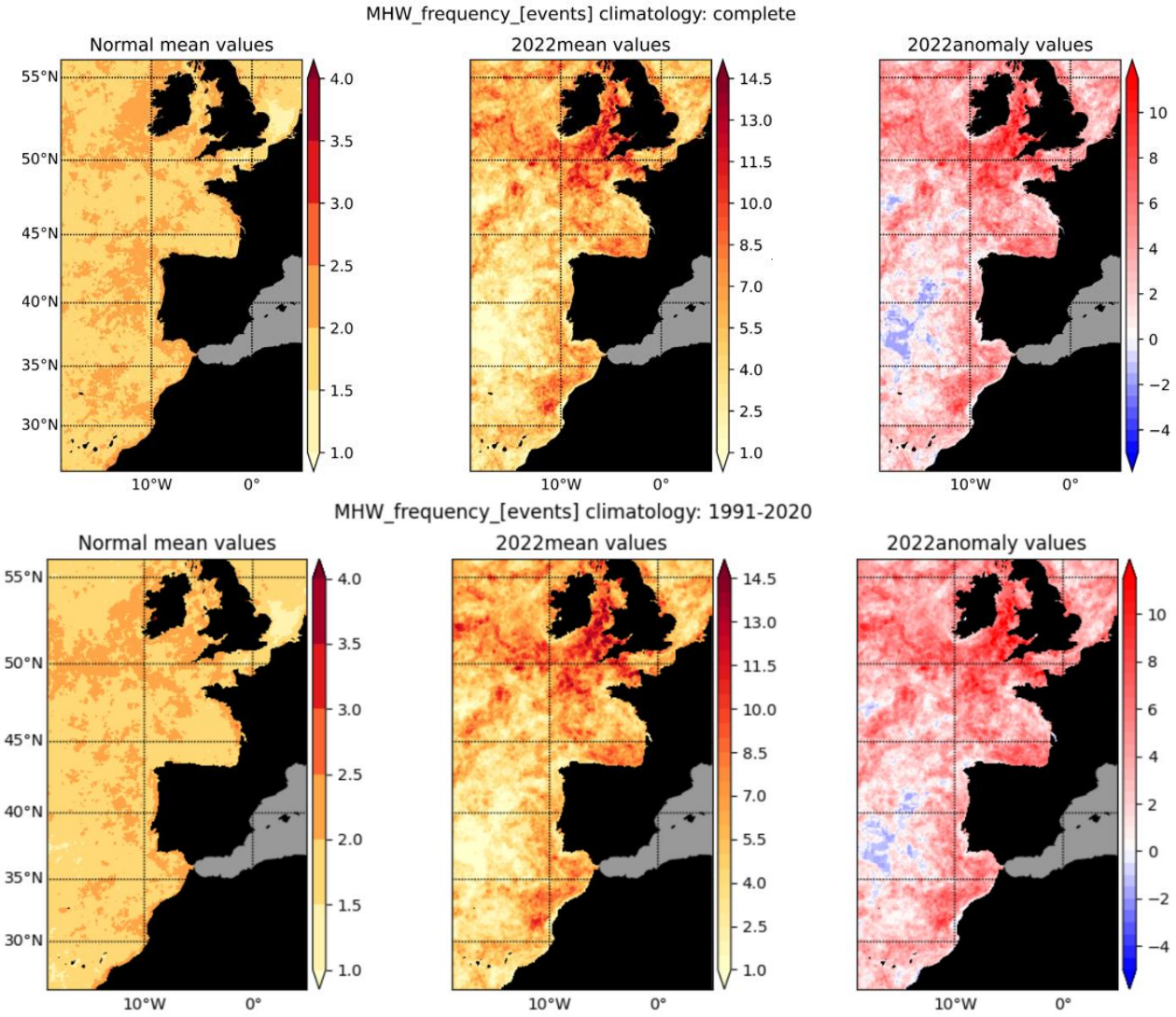
1. Each group can choose the referee period.
2. The period should contain the year 2021.
3. The period must be the same for all datasets used to compute MHW in a contribution.

Hobday et al. (2016) recommends a 30 -year length referring to the WMO; so, there is just one source for justify the 30 -year length, the WMO. The Guide to Climatological Practices (WMO-No. 100) page 75 said:

"The 30-year period of reference was set as a standard mainly because only 30 years of data were available for summarization when the recommendation was first made."

So, the 30 -year period seemed to be a minimum recommended length instead of a specific length. There are also standardized periods to calculate the climatology, updated each decade as used in the study that you mentioned. But as we are suggested to include the year 2021 and the last WMO references period covers from 1991-2020, the standard periods are not an option.

We also perform an internal test to see into how sensitive our results regarding this issue are. Here we show the frequency case; the climatological values, the count for the year 2022 and the 2022 anomaly (both cases with the updated dataset including all the year 2022). The 2022 count and anomaly perform indistinctly according to all the region, which are the core of our study. Some differences may be seen in the normal values despite they are not much relevant. In any case, any of our conclusions change.



As it is not a trivial issue, we will add some justification for the usage of all the period on computing the climatology instead of just 30 -years.

A recent paper (Marullo et 2023) analysed the exceptional MHW of 2022 in the Mediterranean Sea, demonstrating that the 2022 MHW event persisted during the autumn of 2022 and early winter of 2023. The authors demonstrated that the occurrence and growth of sea surface temperature anomalies is linked to the prevalence of a persistent anticyclonic system over the Mediterranean area. The article by Marullo et al. should be cited and the extension of the IBI analysis to the entire 2022 SST time series is strongly recommended. In case the extension of the analysis to the entire 2022 time series is not possible, the IBI MHW result should at least be discussed taking into account the results of Marullo et al. 2023.

Fortunately, we will have the 2022 data for our region, and we will not have to extrapolate results from other regions. On the other side, looking in the new events recorded through the data extension this recommended paper will be used to discuss them.

Finally, the discussion on the removal of the SST trend before identifying MHW and the effect this has on the results obtained should be analysed and discussed more carefully.

This contribution do not has the objective on assessing the magnitude of the influence of the long-term SST trends has on the MHWs results. We applied the standardized procedure to compute MHWs, which says nothing about detrending the data. In this contribution, applying the standard methodologies we obtain very abnormal results where we believe that they could be conditioned by the SST long term trend. In this way, we consider that this issue should be more discussed in the community because, if not, it seems that the standard method may become useless in the framework of a climate change scenario. In the work, we deliberately avoid this discussion, because it is something out of the scope of this contribution, and also because of the length of the contribution. However, given that the influence of trends on the methodology is currently a subject under discussion, we must inform the readers of the potential impact that long-term trends may exert on the results.

Nevertheless, we propose modifying the manuscript by providing additional information on the potential consequences of trends in calculating MHW as described in the current literature for the region.

The analysis of MHW propagation in depth using the ARGO profile should be better described and analysed. The anomaly of the SST profiles for the days before the start of the MHW events should be shown and compared with the SST anomaly during the events. This will make it possible to identify whether, for example, the anomaly at depth is due to vertical propagation of surface warming or whether the SST anomaly observed at depth is due to advection due to changes of circulation.

We all agree that this is a good point. Unfortunately, data limitations in this case are relevant. ARGO data is an irregular sample in time and space increasing drastically the uncertainty of the results. According to the available data we consider that this kind of assessments may be adventurous.

Figure 2. Colours are fully saturated. The colours should be improved. The climatology should be calculated using whole years (January 1982 to December 2021) instead of January 1982 to September 2022.

We will take care of it.

Figure 3. Since the analysis does not cover data for the entire year 2022, the annual average values do not make sense. The authors should provide information on how the annual values are calculated.

The analysis will cover the entire 2022.