We would like to thank the reviewer for their efforts in revising our manuscript and their feedback. We appreciate the time and effort invested in reviewing our manuscript and are pleased that the reviewer finds the topic relevant and the methodology appropriate.

Below, we response comment by comment and outline the corresponding changes made to the manuscript. Reviewer comments are shown in black with the author response in blue. The lines refer to the clean manuscript to which the reviews have been applied.

Reviewer Comments:

Reviewer 1

In this work the authors analyse the impact of different methodologies, namely the reference baseline method, in the MHW detection and characteristics in the Balearic Sea. This is a topic under open discussion among the MHW research community. The authors conclude that the choice of the detection method is crucial depending on the research intended objectives, but that's not a novelty as some recent studies have already underlined. The manuscript is worth publishing but needs some improvement, outlined below.

We thank the reviewer for the positive assessment of our work and the recognition of its relevance to the ongoing discussion in the MHW research community.

The introduction section should more in detail discuss studies on Mediterranean MHWs, that have very recently received growing interest in scientific literature, as the manuscript refers to a Mediterranean subregion. Recent papers discuss the consideration of spatial requirements for MHWs, build MHW catalogues or MHW drivers.

We agree with this suggestion. We have revised the introduction to mention some relevant recent literature (Darmaraki et al., 2024; Simon et al., 2023) to better contextualise the study:

"In their comprehensive review, Darmaraki et al. (2024) gather the findings about MHWs events and their drivers in the Mediterranean Sea, also commenting on known impacts across diverse marine organisms. The authors argue that despite many advances in the field, a single, uniform detection framework remains both technically challenging and, despite its benefits for study-comparability, potentially inappropriate, since it should be adapted to the intrinsic local conditions. MHWs in the Mediterranean Sea are mainly generated due to long periods of anomalously high atmospheric pressure that lead to weakened values of wind speed (Darmaraki et al., 2024; Simon et al., 2023)." [Lines 66-72]

And we have further discussed on the MHW drivers in the Mediterranean:

"Regionally, MHWs in the western Mediterranean basin are generally more intense and frequent, while in the eastern basin they are typically longer (Hamdeno and Alvera-Azcaráte, 2023; Simon et la., 2022). In the western basin, the events are usually driven by large positive heat-flux anomalies (enhanced short-wave radiation and reduced latent heat loss), whereas in the east, they often coincide with decreased upward long-wave radiation (Hamdeno and Alvera-Azcaráte, 2023; Simon et al., 2023)." [Lines 74-78]

The authors use appropriate methodology to assess those impacts and properly discuss them. But the last part of section 4.4 (from line 285) looks on definition impacts in biodiversity more like as a review of the state-of-the-art of MHW biological impacts. These section needs to be, in part, rewritten to better highlight the authors results.

We appreciate this comment and have revised Section 4.4 to better focus on how our methodological comparison impacts the interpretation of potential biological consequences. While some background on biological impacts is still provided for context, we have reduced the general review tone and emphasized how the differences in MHW detection approaches could lead to varying assessments of ecological risk. Now this part reads as follows:

"To illustrate the ecological relevance of these methodological choices, in the Mediterranean, Garrabou et al. (2022) reported that mass mortality events from 2015 to 2019 affected a similar number of taxa as in 2003, with Cnidaria and Bryozoa being the most affected groups. A similar impact was also detected in the study regions, where the intense summer MHW of 2017 led to a proliferation of mucilaginous algae, which triggered mass mortality of gorgonian species and affected sponge communities (Bensoussan et al., 2019). This is relevant because both 2015 and 2017 are highlighted as years with high intensity using the detrended method and with fixed baseline, whereas with a moving baseline the most prominent MHWs appear in 2016. Such effects had been previously observed following the 2003 MHW, when the same mucilaginous algae caused coral bleaching and necrosis in sponges and coralline algae in the Ligurian Sea, Northwest Mediterranean (Schiaparelli et al., 2007). During 2019, Hamdeno and Alvera-Azcaráte (2023) found that anomalously high temperatures coincided with a decrease of surface chlorophyll in the western Mediterranean. Interestingly, 2019 is not a year where we detect high MHW activity. Future work could compare chlorophyll concentration from 2019 with those from strong MHW years such as 2017 or 2022." [Lines 294-304]

Minor comments

Line 40: Please correct "in studies in studies"

The repetition has been corrected. [Line 40]

Line 47: Please correct "underlaying"

Corrected. [Line 47]

Line 65: Change “air-sea heat fluxes and producing a decrease” to “air-sea heat fluxes and produce a decrease”

The sentence has been revised as suggested. [Line 72]

2.4 Marine heat waves metrics

The category list and table 1 are unnecessary as they are well described in the Hobday references. Please consider adding the necessary definitions in a new paragraph.

Following the reviewer comment, we have removed the category list and table 1 and replaced with a concise paragraph summarizing the key metrics:

“For each MHW event, we compute its duration and its mean, maximum and cumulative intensity (Hobday et al., 2016). The mean intensity is defined as the average SST anomaly of a MHW event, the maximum intensity is the highest SST anomaly reached during a MHW episode, and the cumulative intensity is the sum of the daily SST anomalies during a MHW event. We also compute the total number of days per year with MHWs. [...] Following Hobday et al. (2018), MHWs are classified into four categories according to the extent to which they exceed the 90th percentile threshold: Moderate (1-2 times), Strong (2-3 times), Severe (3-4 times), and Extreme (more than 4 times).” [Lines 122-125 and 127-128]

We hope these revisions adequately address the reviewer’s concerns and improve the clarity and scientific contribution of our manuscript. We remain grateful for the helpful feedback.

Sincerely,
Blanca Fernández-Álvarez, on behalf of all co-authors