All of the co-authors would like to thank the referee for the time which he/she has allocated to the detailed revision of this paper, taking the time and effort to provide us with generally positive and constructive feedback. and the well-supported comments about our work. We sincerely value the work done in this review and we are grateful for this. We hope our responses and the improved version of the manuscript will meet the expectations.

Please, find below our point-to-point response with comments of the referee in **black** and our response in **blue**.

General comments

The authors of this study thank the reviewer for the general comments, which have highlighted numerous inaccuracies in our article. As stated in response to Reviewer 1, our main concern is the lack of a clear objective, which is evident upon rereading the article and has been noted by all reviewers.
Initially, it seemed interesting to study both the ability of operational satellites to track oceanic extremes and the response of French coastlines to the exceptional summer of 2022. However, the study was conducted with the goal of characterizing the response of oceans to multiple heatwaves.
Therefore, the article has been revised to focus on this objective and determine the contribution of various atmospheric variables to this response, allowing for a more seamless reading experience. To achieve this, the structure of the paper has been revised to include necessary information for a more comprehensive study of ocean-atmosphere heat exchange interactions. Thereby, we conducted an analysis of the contribution of several atmospheric variables using a modelling approach. Hence, Materials & Methods, Results and Discussions have been largely modified.
In order to not start from scratch on the analysis of temperature data, we have kept the OSI SAF data.

On the specific point about using two different SST data. As explained before, we started by analysing the response of the SST in an operational framework which explained why we kept these data in our study. In any case, both measurements are comparable as they reflect the nighttime SST (or corrected by the diurnal cycle on the specific case of ESA CCI CDR).
We added in the text an explanation on how they are correlated.

Line by line comments

Abstract

(1-3) These initial sentences should be more precise. From the beginning of which measurements? The seasonal average of 22.7°C is intended as surface air temperature, or what? Multiple record-breaking heatwaves over which period?

This sentence has been modified as following :

P1. L1-3
« Summer 2022 was memorable and record-breaking, ranking as the second hottest summer in France since 1900, with a seasonal surface air temperature average of 22.7°C. In particular, France experienced multiple record-breaking heat waves during the meteorological summer. »

(9-10) I would not introduce the core of your study saying that "the contribution of other atmospheric variables is not negligible". This sounds like an a-priori consideration. I believe, instead, that the choices of variables to investigate have a clear motivation and should be better introduced and made more attractive in the Abstract.

The sentence has been removed and replaced by :
P1. L6-7
« Beyond the direct relation between sea surface temperatures and the surface air temperatures, we explored the leading driving factors affecting the upper-layer ocean heat budget and determined the magnitude of such atmospheric factors. »

Introduction

(Figures 1 & 2) The images should be larger, could aid having titles referring to the months. How did you compute the 1991-2020 climatology to which you define anomalies? Since the main rationale of your work in exactly the anomaly in surface air temperature, consider if to switch order of Figures 1 & 2, or if to add a single Figure before these showing the mean spatial anomaly over whole summer, or if a time series.

Fig 1 & 2 have been modified by adding months in the titles. Order has been switched.
We thought about the proposition of adding a single Figure either as a map or a time series. In our opinion, two figures give complementary information about the atmospheric circulation over the summer and the consequences on the surface air temperature.

(25-32) You longly talk about OHC and the reader it brought to think he/she will see some analysis on OHC, which instead is not present. I suggest you shorten OHC description, or you add an analysis of the field in summer 2022.

We completely agree on this comment, thus this section has been removed as it is not related to the topic of this study.

(45-48) As presented this part sounds as if you are describing already some results, because you go specific on dates and causality of events with no reference. I suggest you keep introduction to be more descriptive, eventually recalling in results more specific relations of causation.
Thanks for this valuable comment which we completely agree on. As proposed by both reviewers we added a specific section describing in details the synoptic condition.
Paragraph starting on P8, L232.

Study sites

(64) Since you introduce the SST acronym at line 37, you should not repeat sea surface temperature as a long name after that (it happens in several other points in the manuscript)

P3, L78. This has been modified.

(Figure 3) [not necessary, but suggested] I find that putting a single Figure only to show the regions studied is a quite unhappy choice. To economise I should suggest to plot a field of interest for the presentation (e.g. average SST anomaly, at your preference) and

overplot the chosen basins. Also, I wouldn't talk about a subdivision since you are not considering the whole European Mediterranean subdivided in regions, instead you are choosing specific areas of interest.

As proposed we removed the Figure 3 and overplotted studied areas on the Figure 4 (P15).

Data/Methods

Title has been changed

(76-78) not very interesting nor informative. Also, here you state that you use monthly data to compute the 1991-2020 climatology, then at (112) you say you use daily averages for climatology for the period 1982-2011. You should be clearer and consistent in the presentation.
We agree with the reviewer about the inconsistencies throughout the paper about how we calculated the anomalies. In the present version, we made the calculation procedure clearer and we dissociated the description of the atmospheric climatology from the oceanic one.
To improve the readability of the anomalies computation we decided to have a distinct section (P5, L122 – L133).

(subsection 3.2.1) This section is very detailed. If the purpose of your work is to demonstrate the ability of NRT SST to capture response giving all this information could be justified. At the present version of the manuscript it sounds too detailed.
P4, L97-L113. This section has been shortened in order to be consistent with the objective of this study.

(subsection 3.2.2) it is misleading to entitle the section "SST analysis", as this sounds like you will give some results of your analysis already. You should opt for entitling it as "ESA CCI SST product" or "Satellite derived SST". Indeed, you have section 3.2.3 devoted to describe climatology computation, here you should introduce the product only.
P4, L114. We changed this subsection to detail the ESA CCI product only.

(122) replace "calculating" with "calculated". Replace "long-term value one" with "long-term one"
As we modified the subsection 'SST climatology and anomaly », this sentence no longer exists.

Results

L125 remove "use by the"
P11, L253.
"The primary objective of an operational product is to provide daily monitoring for use by forecasting services."

(125-128) This description is badly written. You talk about ideal case without saying what this means (that is complete data coverage). Please revise accordingly. Also, what do you mean with the basins missing data in percentage? Over the whole period considered? Please specify.

This section has been improved to improve the readability. A reference to the section detailing what are the missing data has been also added.

P6, L125-128.
"The first objective of an operational product is to provide a daily usable monitoring for use by the forecasting services. However, these conditions are ideal cases and are therefore not met in all basins every day. Thus a significant part of the data is not available depending on multivariate conditions (clouds, aerosols, low quality data). This share varies for each basin and is compiled in the Figure 4."

(136) take off "that affected these basins". Summer 2022 anomalies have not interested only your chosen basins.
Corrections made

(Figure 4) Revise date labels regarding August and make them consistent with the others (08-10 instead of 08-09 and so on). Put titles regarding the basins on each panel. Could be informative to report the percentage of missing data somewhere in panels.
Figure 4 has been improved thanks to your comment.

(140) Revise how you write dates. For example, "between the 6th of July and..." should be "between July 6th...", similarly onwards
We have checked all the date to have a consistent and standardised format

L144 where are these anomalies shown?
Reference to the table 2 was missing thus we added it in the sentence. We also modified the table 2 to improve readability. We also added the variation of coefficient in addition to the standard deviation to get more insights in the variability of the SST anomalies.

P11, L274-276.
« This is also high- lighted by the variability, presented in the Table 2, which is comprised between 31% and 46% of the mean SST anomaly for a standard deviation between 0.5°C and 0.8°C »

L147 where is this given? Not evident to reader. Need to properly refer to figures.
We finally decided to remove this sentence and modify it to the following one:

P11, L276-279.
"With the exception of specific episodes, SSTs remain close to the climatological maximum of the period 1982–2011 (Fig.3). In addition, it is noteworthy that the NWM experienced 22 days, EC experienced 19 days, and BB experienced 4 days of SSTs exceeding the climatological maximum. It should be noted that the previous temperature record in the NWM dated back to 2003, underscoring the historical significance of the observed response."

(152) you report that temperatures are constantly above climatology by referring to Table, where only average values are given. State better
Reference to the Figure instead of the Table has been done

P12-13, L283-284. « During this period, SSTs were abnormally high, with temperatures constantly above the climatological norm (as shown in the Fig 3). »

(Table 4 & Table A1). Table 4 does not exist, but only Table 1. I believe that confusion is made while describing content of tables. In text you say that Table 4 refers to July 31st - August 13th event, but caption of Table in text says differently. Revise accordingly. Consider to put them both in main text, to aid comparison and enable following values reported in text better.

As proposed by the reviewer, we put the table A1 in the main text (it is now referenced as Table 2).

The mentioned confusion comes from the mismatch between Table and Figure. We have corrected this by referring to the correct reference (Figure 3 instead of Table 4). We have revised the figure/table captions and the mentioned referenced in the text.

(158) where do you show the trend?? You are showing average values in Figure 5.

This is a mistake in the text, actually we were not intended to talk about a trend. Our point is to show that this warming is uniform and affect all the studied areas as seen in Figure 4.

P13, L290-291.
«Positive temperature anomalies were found throughout the majority of the ocean surface and the trend of increase was spatially uniform (Fig. 4) »

(Figures 5 & 6) It could be useful to recall the regions selected overplotted on fields shown. Also, consider in showing only one of the two periods to not sound repetitive.

As proposed by the reviewer, we consider that adding the studied regions on this figure will help readers to follow the study. We also rearranged the figures to finally keep only one representing better the focus of our study.

(165-171) where are these results shown in figures? Are you talking about Figure 6 23rd – 30th July event or August event? It is not easy to follow as a reader.

This paragraph referred to the comparison between the Figure 4 and 5 related to the July 31th-August 13th heatwave. We add a precision in the text and make the reference to the correct figure.

« As previously mentioned in Section 5,1, SSTs were already abnormally warm before the August 31th to August 13th heatwaves. »

(Section 4.3) in my opinion contains very interesting comments. Consider to enlarge this description, deepening further the phenomenon and recalling it clearly in conclusive remarks.

Consequently to this comment and a similar one from Reviewer 1 we decided to get further insights into the contribution of atmospheric variables by adding further developments. To address this we conducted an attribution analysis based on a modelling approach. The results are presented in the section 4.4 starting on P16, L338.

(174) typo: *persistence
Typo corrected

(179) specify that the anomaly you are talking about is of cloud cover
P14, L319-321.
"The mean total cloud cover anomaly over France reaches -17% while the North of France and specifically Brittany have undergone the maximum average anomaly of -37%"

<u>Discussions</u>

(198) typo: *studies
Typo corrected.

(246) Not clear what you mean when you say "to prevent the detection of anomalously warm SST"
P24, L506 « To anticipate the detection of anomalously warm SSTs »

Comments of the lines 204-206, 200-206 & 213/244

In addition to the newly introduced features that were added to the results section to reflect the sensitivity test, we have also reorganized and rephrased the Discussion/Conclusion section. Specifically, we incorporated the feedback provided by Reviewer 2 and removed all introductory comments to streamline the content.