

Response to the Reviewer

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“The 2025 Mediterranean marine heatwaves throughout sea surface temperature analogues”

D. Faranda, T. Guinaldo, F. Pastor, T. Alberti, S. Khodayar

Dear Prof. Lionello, dear Reviewer,

We thank the reviewer for the very positive assessment of our manuscript and for the final set of minor comments, which we have addressed in full in this revised version. Below we reproduce each comment in italics and follow it with our reply. All changes are highlighted in the marked-up version of the manuscript accompanying this letter.

The reviewer wrote:

“The authors have substantially improved their manuscript in the final revisions both in terms of the results and in the discussion. The article now discusses more coherently both the advances and the limitation provided by the analogue-based method in the examination of the 2025 MHW in addition to a more clearly structured manuscript. I only have minor comments for the authors to address at this point.”

Reply: We are grateful for this encouraging evaluation and thank the reviewer for the careful reading of the manuscript. We have addressed all the minor comments listed below.

Line 15.

“For a first sentence of the abstract, there is too much detail about the development and evolution of the MHW, which is information more appropriate for a results section. In the case of the abstract it could be put as simply as “The Mediterranean Sea experienced an exceptional marine heatwave throughout June-July 2025”.”

Reply: Adopted. We have shortened the opening sentence of the abstract exactly as suggested. It now reads: “The Mediterranean Sea experienced an exceptional marine heatwave throughout June-July 2025.” The details on the development, peak, and persistence of the event are already provided in the event-characterization section (Section 3) and are no longer repeated in the first sentence of the abstract.

Line 23.

“Adriatic Sea”

Reply: Corrected. “the Adriatic” now reads “the Adriatic Sea” in the abstract.

Line 24.

“...shortwave radiation over large parts of the basin”

Reply: Adopted. In the abstract, “over broad parts of the basin” has been changed to “over large parts of the basin”.

Line 38.

“...at a global scale”

Reply: Corrected. “at the global scale” now reads “at a global scale” in the introduction.

Line 56.

“An alternative expression of unequivocally established could be “well established””

Reply: Adopted. “is now unequivocally established” has been replaced by “is now well established” in the introduction.

Line 306.

“Maybe instead of discriminating, use “distinguishing”?”

Reply: Adopted. “Discriminating between these explanations” now reads “Distinguishing between these explanations” in the discussion.

Line 312.

“Instead of “such as MHW”, “like other MHWs”?”

Reply: Adopted. The phrase “such as other recent MHW” has been changed to “like other recent MHWs”.

Line 313.

“Why does the wind speed and turbulent heat fluxes are considered here as representatives of the large-scale dynamical regime? Aren’t these two regional influences?? What do you mean by large scale?”

Reply: We thank the reviewer for this important point, and we agree that near-surface wind speed and turbulent (latent and sensible) heat fluxes are indeed regional, air-sea coupling quantities rather than measures of the large-scale circulation itself. Our intention was to use these fields as observable diagnostics of the atmospheric/dynamical conditions accompanying the event, as opposed to the purely thermodynamic background (SST, T2m, incoming shortwave radiation), but the original wording overstated this by labelling them as the “large-scale dynamical regime”. We have rephrased the sentence to make the distinction explicit. It now reads: “...the 2025 event’s exceptional character, like other recent MHWs (Gyuleva et al. 2025, Dong et al. 2025), was not primarily driven by a shift in the atmospheric dynamical conditions associated with the event, here diagnosed through the near-surface wind and turbulent heat flux composites, which reflect the regional air-sea coupling rather than the large-scale circulation itself, but rather by the superposition of a recurrent SST anomaly pattern onto a warmer thermodynamic background...” In this way we clarify that these two variables are used as regional indicators of the dynamical/air-sea conditions, and we no longer describe them as representative of the large-scale circulation.

Additional editorial points

*"Please move the "Correspondence" section with the corresponding author's details (name and email address) from line 431-432 to the title page of the *.pdf manuscript (line 13-14) with the next revision."*

Reply: Thank you for pointing this out. In the revised manuscript the "Correspondence" line ("Correspondence to Davide Faranda: davide.faranda@cea.fr") now appears on the title page, immediately below the author affiliations and above the Abstract (line 13). It is no longer located near the end of the manuscript.

"Page numbers were missing from the manuscript. As this is a requirement, we added the page numbers ourselves and uploaded the updated manuscript to the system on your behalf to avoid delays."

Reply: We are grateful to the editorial office for adding the page numbers and for uploading the updated manuscript on our behalf. We apologise for the omission. Page numbers (centred in the footer) have also been included in the manuscript file accompanying this revision, so that our version is fully consistent with the one already in the system.

We hope that the reviewer will find the revised manuscript suitable for publication, and we remain at your disposal for any further clarification.

On behalf of all co-authors,

Davide Faranda