Review of the article titled “Monitoring the record-breaking wave event in Melilla harbour (SW Mediterranean Sea)" by Lorente, P., et al. 2023

The manuscript "Monitoring the record-breaking wave event in Melilla harbour (SW Mediterranean Sea)" by Lorente, P., et al. 2023 uses different database such as reanalysis, forecasting model, radar tide-gauge and *in situ* coastal buoys, to describe an oceanic extreme event that occurred in the Melilla port during April 4^{th} and 5^{th}, 2022. It also analyzes the extreme regime in the Alboran Sea. The impacts of extreme wave events on harbors and the need to revise the level of security within them regarding the new climatic conditions are interesting points to study. However, the reviewer considers that the article needs crucial improvements throughout the manuscript before being considered for publication in the journal State of Planet.

OVERALL COMMENTS

- The abstract should be rewritten to provide a more comprehensive explanation of all the values presented by the authors.
- One of the main shortcomings of the manuscript is the explanation of the different datasets used. To consider the article for publication, a comprehensive restructuring of the data section is necessary to address the following issues:

    1. What is the source of the data?
    2. What is the period during which they were used?
    3. What are the temporal and spatial resolutions?
    4. When and why were these data used?

    All this information can be included in Table 1. I suggest including the following columns in Table 1: Variables (SWH, wave period, wave direction, etc.), temporal resolution, spatial resolution, and time span.

- The time span for the different datasets should be standardized. Sometimes the time period is from 1993 to 2022, while other times it is from 2010 to 2022, or from 2008 to 2022, or even from 2015 or 2011 to 2022. This inconsistency extends throughout the article, including the methods section and various figures. If standardization is not possible due to the different scales analyzed, it must be specified why and reference the database being used.

- Why is the “wave forecsast model” of Puertos del Estado used? Would not it be more consistent to use the same database for atmospheric and oceanic variables (such as ERA5)?

- Another deficiency of the manuscript is the lack of consistency in calculating the 99^{th} percentile. The authors use both the annual and monthly 99^{th} percentile, as well as climatology (the average of each of the months, e.g., January, February, etc.), interchangeably, even though these values are statistically different.

- The methods section should be rewritten and restructured, as the method described as "the percentile method" is essentially the peak over threshold (POT) method. Why was the 99^{th} percentile threshold chosen as a reference instead of other values?

- The use of tables is excessive in the manuscript, making it challenging for the reader to follow the narrative. Tables 2 and 3 should be integrated into the introduction section to improve readability. Additionally, Table 4 should be removed, as the results presented there are better visualized in Figures 1 and 3.

- The figures should be renumbered according to their order in the manuscript.

- A climatic analysis is recommended, including an examination of correlations with different climatic indices influencing the area and an analysis of temporal variability using for example, wavelet-type tools.

- The manuscript neglects the value of tides, even though the tidal range in the Mediterranean can reach up to 1 meter. However, it has been proven that the 99^{th} percentile of the IG is 0.28 m, and of the agitation range is 0.38 m, which is within the order of magnitude of tides in the Mediterranean. Therefore, a sensitivity study of the tidal value in the port should be conducted before neglecting this factor.

- The third major deficiency in the work is the study of extreme event trends in Melilla port. In Figure 4, it can be seen that for the area marked with a black rectangle, most of the pixels do not show a significant trend for April or July (the two months selected for a comparison between P99 and P50 in Annex 4). In my opinion, it cannot be concluded that the regression line is significant based on the time series shown in Figure 4 of the manuscript; the series exhibit too much variability.

- In this work, the analysis of wave height is detailed, while the analysis of wave period is given less attention, even though, for agitation activity, the period is more relevant than the wave height (Eq. 4). This is why in event E7, the agitation is so high compared to the time series, as the period at that time is significantly higher than in the rest of the time series. This fact should be given more emphasis, and the atmospheric conditions that could have caused this remarkable event should be explored.

- The conclusion section could focus more on how ports need to revise their security protocols based on studies of extremes in the surrounding area, taking into account the analysis of return periods.

SPECIFIC COMMENTS

Introduction

L41. Modify the order of the tables according to when they appear in the text.

L44. Provide the link to the ECCLIPSE website.

L55. Infragravity waves have a period ranging from 25 seconds to 5 minutes, as indicated by [Munk, 1950].

L59. Table 4 could be omitted as it is redundant with figures 1 and 3.

L60. In the study area, significant wave heights (SWH) exceed 7m, the same order of magnitude than in the Gulf of Lion.

Data

L110. When does the multi-year wave product reanalysis end and the interim dataset begin?

Methodology

L129. Why if there are buoy data from 2008, do the authors choose to use them only from 2010?

L137. Which spiking method did you use? Were the gaps small enough to ensure that the time series was not totally distorted after processing?

L140. Pearson correlation coefficient.

Eq 2 and 3. Why do you use the sample variance instead of the population variance?

L155. The correct reference was Stockdon et al. (2006), not Inch et al. (2017).

L160. Specify the data that were used.

Results

L173. Specify the time span.

L180. Why do you consider data for wave directions only for the period between 2011 and 2022?

L186. How do you calculate the exceedance threshold and the time between two independent storms?

L233. Could you provide spectra to demonstrate how the infragravity waves dominate the energy during the analyzed events?

L235. It is not possible to see all these results in Table 6. Could you display them graphically?

L243. Would you mean "20 minute time-series"?

L253. Instead of "the 655 hourly", it would be clearer to mention the time span.

L268. How do you calculated the "monthly P99"? Is it the P99 of all the January data (February, March, etc.)? Or is it the mean value of all the P99 from all the January, February, etc. months?

Conclusions

L313-321. These points should be included within the introduction section.

L336. It is not the "percentile's method", it is the peak over threshold.

Bibliography

L421. Berta, et al. (2020) should appear after Bensoussan, et al. (2019).

Annexes

Annex 3. Adjust all the colorbars, as P99 seems smaller than P50.

Annex 5. Consider removing this annex because the most of the pixels show non-significant trend values.

References

Walter H Munk. On the wind-driven ocean circulation. *Journal of meteorology*, 7(2):80–93, 1950.