Dear Dr. Alejandro Orfila,

Thank you very much for your comments and suggestions. We improved the manuscript according to them, and we specifically addressed the raised points below in red.

Review Ms sp-2022-7 ''Recent changes in extreme wave events in the Southwestern South Atlantic'' by Gramcianinov et al.

The Ms. studies the spatial and temporal variability in the extreme wave events in the Southwest South Atlantic using CMEMS global wave reanalisis and near real time products for the period 1993-2021. Authors analyze the annual and seasonal Hs, extreme wave events defined as the 95th percentile of Hs, peak period, intensity, wave direction and wave power providing insights on how trends would impact the coastal zone using a coastal hazards database. The paper is well written, the methods sound, and the research provides a good overview of the long term evolution of extreme wave events in the area of the SWSA. Prior publication however some minor points should be addressed.

1. Why is the duration for the extreme events set as 48h? Usually a 72h period is considered for an independent analysis of storms.

R. In our method to compute the percentile, the minimum storm duration is 48 h, but it can persist for longer. The Hs peaks selection is made in two steps: 1) all peaks in the time series are selected by local maxima by comparing neighbouring values; 2) smaller peaks are removed until the minimum distance condition is fulfilled. We choose 48 h based on references (e.g., Caires and Sterl, 2005; Meucci et al., 2020), as it is a not-so-restrictive time threshold, especially to mid-latitudes, considering seasonal analysis. Pick a large time threshold would result in higher percentiles that may hinder the extreme event analysis in some locations and seasons. This is explained better in the revised manuscript.

Lines 76 – 81: *"The selected Hs_{peaks} must be separated by a minimum of 48 hours to guarantee the independence of the peaks. This time window has been widely applied in past studies to ensure the collection of one peak per storm (e.g., Caires and Sterl, 2005; Meucci et al., 2020). Besides that, 48 hours is a suitable but not-so-restrictive time threshold for extreme wave analysis in the region, particularly considering the differences among the seasons."*

2. Regarding #1. Is the intensity and number of events robust in front of the time window?.

R. To respond to this comment, we present two points:

(a) The number of events is indeed high if we take into consideration the 5% most intense events using a time window of 48 h. The SET applied in this study is based on the average of the monthly 95th percentile for the whole period (29 years x12 months) since we need a fixed threshold for the period to evaluate the trends. The averaging smoothed the percentile, mainly due to seasonal variability throughout the year. The result is presented in Fig. 2a, which shows lower values than the percentile computed if we used the Hs_{peaks} in a 29-years time series. The exceedance of the average percentile is larger than 5% for some locations. The choice of using e of the average of the monthly percentiles is to ensure consistency in the analyses. Otherwise, we would have several period-based percentiles, and the evaluation of the results would be inconsistent. We clarified the use of the averaged monthly 95th percentile in the reviewed manuscript.

Lines 98 – 99*: "Moreover, the use of averaged monthly percentile results in a smoothed field, especially due to the Hs_{peaks} variability among the year. In this way, for some locations, the exceedance of events above SET is large than 5%."*

(b) The number of events and intensities are comparable to previous studies, even though method differences exist, thus making a straightforward comparison difficult. For instance, Gramcianinov et al. (2021) used the 90th percentile and a vary time window computed according to the autocorrelation function in each grid point. They found that the mean of 1.3 and 5.5 extratropical cyclones per year promoted extreme waves event in the region in the summer and winter, respectively. These values are coherent with the values presented in the maps of Fig. 1f,j. Regarding the intensity, the same authors found the mean Hs of 6.5 m associated with the cyclones' events, which is also comparable to the intensity values (above the percentile) in some locations of the study domain (Fig. 1g, k). Moreover, Machado et al. (2010) accessed extreme wave events in the coastal region between 30ºS and 32ºS and found a mean of 1.33 events per year above the 90th percentile (1979-2008). We also reported this relatively small value at this exact location in Fig. 1b,f,j. We added some information about the robustness of our findings compared to previous studies in the reviewed manuscript.

Lines 164 – 173*: "The overall pattern and values presented in Fig. 1 agree with previous studies, even though method differences exist, thus making a straightforward comparison difficult. For instance, Gramcianinov et al. (2021), using the 90th percentile computed through a spatially-varying time window, found a mean of 1.3 and 5.5 extratropical cyclones per year associated with extreme waves event in the region in the summer and winter, respectively. These values are comparable with the number of events presented in the maps of Fig. 1f, j. Regarding the intensity, the same authors found the mean Hs of 6.5 m associated with these cyclones' events, which is also comparable to the intensity values (above the percentile) in some locations of the study domain (Fig. 1g, k). Moreover, Machado et al. (2010) accessed extreme wave events in the coastal region between 30ºS and 32ºS and found a mean of 1.33 events per year above the 90th percentile between 1979 and 2008. We also reported this relatively small value at this exact location in Fig. 1b,f,j. In this way, the method applied herein presents robust results according to what is reported in the region."*

3. Figure 2. If possible I suggest to include in this figure the wave power due to the additional interest in potential locations for power generation.

R. Thank you for your suggestion. In the revised version, the mean wave power maps were added in Figure 2.

4. Figure 3. The caption does not correspond to the Figure.

R. We revised and adjusted the mistakes in the captions.

5. Figure 3 a,b, c and d. Besides the trend, can there be any relation in the wave climate and extreme events inferred from the large scale climatic modes of variability? (see for instance https://doi.org/10.1016/j.pocean.2021.102660).

R. Thank you for this comment. It is, indeed difficult to directly relate the trend in the SWSA with climatic modes since there are many regional-to-large scale interactions affecting the region (e.g., ENSO, PSA, MJO). These modes interact with each other in different time scales resulting in different outcomes for the storm tracks and, consequently, for the waves. In this way, it is not trivial to correlate wave variability and climatic index or separate their effect over the region. A fully dedicated study needs to be conducted to address this. We added a discussion about this problem in the revised version of the manuscript.

Lines 206 – 209: *"By the time series, it is possible to note a high variability due to large-scale climate modes that affect the regional wave climate through storm track shifts (e.g., Ramos et al., 2021; Sasaki et al., 2021). The SWSA is affected by many large-scale variability modes that interact, being widely studied in the atmosphere but still not well understood in the wave fields (Sasaki et al., 2021; Godoi et al., 2020; Godoi and Torres Júnior, 2020), which make it difficult to correlate climate indexes with Hs parameters directly."*

The paper is a very nice contribution.

Thank you.

References:

Caires, S., and A. Sterl. "100-Year Return Value Estimates for Ocean Wind Speed and Significant Wave Height from the ERA-40 Data", *Journal of Climate* 18: 1032-1048, https://doi.org/10.1175/JCLI-3312.1, 2005

Godoi, V. A. and Júnior, A. R. T.: A global analysis of austral summer ocean wave variability during SAM–ENSO phase combinations, Climate Dynamics, 54, 3991–4004, https://doi.org/10.1007/s00382-020-05217-2, 2020.

Godoi, V.A., de Andrade, F.M., Durrant, T.H. *et al.* What happens to the ocean surface gravity waves when ENSO and MJO phases combine during the extended boreal winter?. *Clim Dyn* **54**, 1407–1424 (2020). https://doi.org/10.1007/s00382-019-05065-9

Gramcianinov, C. B., Campos, R. M., de Camargo, R., and Guedes Soares, C. Relation Between Cyclone Evolution and Fetch Associated With Extreme Wave Events in the South Atlantic Ocean. ASME. *J. Offshore Mech. Arct. Eng*.; 143(6): 061202. https://doi.org/10.1115/1.4051038, 2021.

Machado, A. A., Calliari, L. J., Melo, E., and Klein, A. H.: Historical assessment of extreme coastal sea state conditions in southern Brazil and their relation to erosion episodes, Panam. J. Aquat. Sci., 5, 105–114, 2010.

Marília S. Ramos, M. S., Farina, L., Sérgio Henrique Faria, S. H., Li, C. Relationships between large-scale climate modes and the South Atlantic Ocean wave climate, *Progress in Oceanography*, 197, https://doi.org/10.1016/j.pocean.2021.102660, 2021.

Meucci, A., Young, I. R., Hemer, M., Kirezci, E., and Ranasinghe, R.: Projected 21st-century changes in extreme wind-wave events, Sci. Adv., 6, eaaz7295, https://doi.org/10.1126/sciadv.aaz7295, 2020

Sasaki, D. K., Gramcianinov, C. B., Castro, B., and Dottori, M.: Intraseasonal variability of ocean surface wind waves in the western South Atlantic: the role of cyclones and the Pacific South American pattern, Weather Clim. Dyn., 2, 1149–1166, https://doi.org/10.5194/wcd-2-1149-2021, 2021.