

Weather Clim. Dynam. Discuss., referee comment RC2
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Comment on wcd-2021-29

Anonymous Referee #2

Referee comment on "Intraseasonal variability of ocean surface wind-waves in the western South Atlantic: the role of cyclones and the Pacific South-American pattern" by Dalton Kei Sasaki et al., Weather Clim. Dynam. Discuss., <https://doi.org/10.5194/wcd-2021-29-RC2>, 2021

Review for "Intraseasonal variability of wind waves in the western South Atlantic: the role of cyclones and the Pacific South-American pattern" by Sasaki et al.

Recommendation: Major revision.

The authors examine the causes for the "significant wave height" (swh) in the western South Atlantic (wSA) region on intra-seasonal timescales. They use EOF analysis and cyclone tracking and find that the different phases of EOF1,2 of u10 are responsible for larger/smaller swh in wSA, as well as that the u10 variability is related to the intra-seasonal variability within the Pacific South-American (PSA) pattern, suggesting a remote impact on the wSA atmosphere-ocean variability. Their results are important for further understanding of the causes of swh, which has large societal impacts (especially on intra-seasonal timescales), thus I recommend this manuscript for the publication in the Weather and Climate Dynamics, subject to revisions suggested below.

Major comments

There are a few parts that I found a bit confusing and would like to see them clarified before the manuscript is published.

l. 33-38: you seem to talk about SAM and NAO as though they are primarily interannual indices, but they are really oscillations that we consider relevant on weekly/submonthly timescale. They do of course exhibit interannual, decadal, multidecadal variability. I just think that the wording is perhaps confusing, or maybe I am not understating the point here. ENSO of course is interannual and it can impact SAM/NAO on those timescales, but SAM/NAO are primarily subseasonal. I think this should be corrected throughout the manuscript. It is also confusing when you say that there is no link to SAM here, then discuss later in the results that there is a link?

l. 164-170; Fig. 5:

- phase A in timeseries is when PC is strongly positive (Fig. 5a), hence I would expect the EOF pattern for phase A to be a positive-monopole (i.e. Fig. 5b would then have red colours and 5c blue colours).
- Also, scale on colourbar seems wrong or maybe scale for PC timeseries is wrong? Is it really in metres?
- Also, I think it might be better to use u10 in Fig. 5 instead of swh, since you mostly look at composites for u10. Perhaps put current Fig. 5 in Appendix together with all other composites for swh EOFs.
 - For the sake of consistency, I think you should composite all quantities based on the same variable (i.e. u10, swh, cyclogenesis etc. composited over EOFs of u10; or alternatively over EOFs of swh)
 - There seem to be differences between composites over EOFs of u10 and EOFs of swh (see below).

Section 3.2: in several places you mention that composites from u10 EOFs are similar/consistent with composites over swh EOFs. I see many differences between the two.

- Fig. 6 vs. Fig. B2:
 - panels (a) largely show opposite sign (where track density is positive in Fig. B2a it is negative in Fig. 6a); and swh composites show weaker anomalies.
 - panels (b) show a meridional shift between swh and u10 composites (tracks in u10 composite are shifted polewards compared with tracks in swh composite). By how much it is hard to tell. Again, composites over swh show weaker anomalies.
 - panels (c,d) are somewhat consistent (though it is hard to tell), but anomalies are weaker for swh composites.
- Perhaps the issue is that swh lags behind u10 – e.g. if you do lag-correlations between PCs of u10 and swh you may find a lead-lag relationship between the two. So instead of correlating the two at lag 0 like in Table 1, correlate them for several positive and negative lags, to establish a clearer relationship. If you then lag data accordingly you might then get the “same” results for swh and u10 composites – or just plot general lag-composites. OR the swh and u10 peak in different locations.
- Another thing I can think of is that EOF1 and EOF2 may not be entirely independent at longer lags (at lag 0 they are by definition uncorrelated) and may represent propagating mode (i.e. if you did a POP analysis [and I am not suggesting you do it] you might find EOF1,2 of u10 to represent the same POP’s real and imaginary components). Indeed, PSA (and also SAM) modes are like that and if EOFs1,2 of u10 are related to PSA modes then this can also be a part of the story (i.e. both modes impacting swh at different lags).
- Also, I think that u10/swh A & B composites should be shown over the same regions as cyclone tracks and genesis – that way a link between these quantities can be clearer; i.e. use Fig. 6 type plots also in Fig. 5b,c, & Figs. 7,8.
- Note that track densities following wind anomalies are likely consistent with positive baroclinic feedback (such as that presented in Robinson 2000).
- l. 182: you mention SAM: so do you ultimately find any links to SAM or not?

l. 201-208: Similar to the above comments: swh and u10 seem to be out of phase – perhaps plotting both of them on the same plot (one in contours and one in shading) could help you (or me) whether they are out of phase and by how much. Again, there is likely a lead-lag relationship or they are simply peaking in different locations.

l. 216-217: I can also see SW-NE orientation south-west of SBB, which makes me wonder

if this is what brings high shww to SBB?

Fig. 9: I think I can see cyclone-anticyclone (trough-ridge) pairs in all panels, but the exact position, orientation and magnitude differ. For example, Fig. 9a,d have the pair oriented along the S. America coast (i.e. SW-NE), but in Fig. 9b,c the orientation is perpendicular to the coast (i.e. NW-SE).

- Perhaps you could think about a future study where you could do a regime perspective (e.g. using K-means) to really classify different regimes that cause this sw. [just a suggestion for future work]

Fig. 11 and discussion around it:

- The years/dates discussed in text and Fig. caption do not match panel titles. So I am not sure if the panels are wrong, or their titles.
- I also find it hard to follow what feature the authors are talking about – I suggest circling the features you discuss (or drawing a line along the wave train)

Overall, I think that some lead-lag relationships are missing, and that once those are established everything will make sense.

Other comments

- "wind waves" – are you referring to storm surge or something else? Please clarify in the introduction.
- l. 4: westerlies --> westerly
- l. 5: analysis --> analyses
- l. 12: cyclones track --> cyclone tracks
- l. 20: drive --> driving
- l. 33-34: indexes --> indices
- l. 41,42: presumably it is "sw in wSA"?
- l. 38-43: You mention that BSISO is relevant for boreal summer (austral winter), I would mention that ENSO-MJO is an austral summer phenomenon; e.g. adding "austral summer" in front of "sw" on l. 42.
- l. 54: on --> in
- l. 67: as well as --> but also (??)
- l. 87: being --> with (??) ; variable in --> variables on
- l. 88: in --> on
- l. 96: presents --> has (??)
- l. 105: Sect. --> Appendix (??)
- l. 112,337: superscript degrees ("o")
- l. 121: by "mean daily climatology" – have you smoothed it or is it raw mean? [just checking]
- l. 134: link is unnecessary, just keep "O'Kane et al. (2017)".
- Fig. 2: u10 EOFs look more tilted than EOFs of sw; the location of negative lobes of u10 EOF1,2 are where SAM can have an impact (which is somewhat mentioned later in the text);
- Table 1: I am little bit confused by the correlations – EOF1 u10 vs EOF1 sw is a

positive correlation; but other u10 and swh correlations are negative, suggesting anti-correlation (i.e. positive u10 mode related to negative swh mode – strong for EOF2).
Table caption – if correlations are computed at “lag-0” please specify it.

- Fig. 4: Is there no red-noise-like low-frequency “peak” because you consider periods shorter than 16 years or? I would expect red-noise like behaviour at low frequencies.
- l. 173,6: on Appendix B --> in Appendix B
- l. 184: B --> B (A)
- l. 215: being --> with (??)
- Caption to Fig. 9: (a) --> (a,c) ; (b) --> (b,d) ; add “for EOF1 (a,b), EOF2 (c,d): after “B”. (??)
- l. 220-229: you mention cyclones in different locations, but I also see anticyclone-like features over the continents in some cases and over the sea in other cases.
- l. 223-224: you see a cyclone to the southwest of SBB in Fig. 9c? Is it outside the map’s bounds (i.e. not shown)?
- l. 247, caption to Fig. 12: Hovmoìllers --> Hovmoìller
- l. 285: up-level --> upper-level
- l. 286: 1997).. --> 1997). [one dot too many]
- l. 292-3: As mentioned under major comments: swh and u10 modes can be out of phase.
- l. 344-348: I know the authors find no tropical links, but the impact from PSA on genesis reminds me of the paper by Schemm et al. 2018, who showed that N. Atlantic genesis location depended on ENSO phase (here it may depend on PSA phase).
- l. 358: once --> since (??)
- l. 372: direct --> direction (??)

Note: “(??)” means “Is this what you meant?” or “Something like this perhaps?”.

References:

Robinson, W. A. (2000). A Baroclinic Mechanism for the Eddy Feedback on the Zonal Index, *Journal of the Atmospheric Sciences*, 57(3), 415-422

Schemm, S., Rivière, G., Ciasto, L. M., & Li, C. (2018). Extratropical Cyclogenesis Changes in Connection with Tropospheric ENSO Teleconnections to the North Atlantic: Role of Stationary and Transient Waves, *Journal of the Atmospheric Sciences*, 75(11), 3943-3964