

Ocean Sci. Discuss., referee comment RC1
<https://doi.org/10.5194/os-2022-1-RC1>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on os-2022-1

Anonymous Referee #1

Referee comment on "Mechanism of generation and propagation characteristics of coastal trapped waves in the Black Sea" by Müjdat Aydın and Şükrü Turan Beşiktepe, Ocean Sci. Discuss., <https://doi.org/10.5194/os-2022-1-RC1>, 2022

Review of the Manuscript OS-2022-1 "Mechanism of generation and propagation characteristics of coastal trapped waves in the Black Sea" by Müjdat Aydın and Şükrü Turan Beşiktepe

General comments

In this manuscript, the authors use observations of sea level height at coastal stations in the southern Black Sea to identify the intermittent existence of coastal trapped waves (CTWs). Making use of wind measurements and an ocean reanalysis they suggest that these CTWs are generated by wind stress and accelerate the Black Sea boundary current.

The excitement and propagation of CTWs in the southern Black Sea that impact the boundary current is an interesting, new finding that deserves publication. The mechanism the authors propose seems reasonable, but the authors should be more honest in that most of the general conclusions they make are based on a case study. While the reanalysis data provide good context for the observations, they are only used to investigate a single event. Additional analyses of other events would make the results more robust and would provide more evidence for the general conclusive statements. Please see my specific comments below.

The manuscript is well-structured and easy to read, but language corrections will help make the text flow better. The figures need (mostly minor) improvements to enhance clarity. Please see my technical comments regarding figures and language below.

I recommend publishing this manuscript after moderate revision.

Specific comments

- In the abstract, please state the knowledge gap more clearly and highlight the novel findings of your study. This becomes more clear in the introduction, but could/should be emphasized in the abstract.

- L9: Consider referring to this data set as "reanalysis" instead of "model" throughout the manuscript.

- The introduction is very long relative to the length of the entire manuscript. Consider tailoring it more to the background of your study (i.e., shorten the general part in the beginning and/or move some of the context from the Black Sea to a more extended discussion section).

- L75: Please state the periods of the oscillations in days, not hours, to be consistent with the rest of the manuscript and to make it easier for the reader to compare the values.

- L83f: How do the results of Staneva et al. (2001) compare to your study? This would be interesting to elaborate on in the discussion section.

- L90: I am wondering about the "inertial current" - is the rim current not in geostrophic balance?

- L95f: This is something that could be addressed in more detail in Section 5. In particular, be explicit about how the stability may be affected (weakening vs. strengthening). Are there any topographic features where the waves could scatter (like the Crimea Peninsula in Yankovsky and Chapman, 1955, 1997)? Are there any local "hot-spots" of eddy kinetic energy (which could be inferred from, e.g., satellite altimetry)?

- L116: Please provide an URL or DOI for the hourly wind data in the data availability section.

- L121: Maybe "southern Black Sea" is more appropriate.

- L131: Can you provide a reference for that the changes in freshwater influxes from rivers are decadal (versus interannual variability)? This is not obvious.

- L133: Please provide a reference if there is a study that has shown the link to the atmospheric forcing (or reword and refer to your section 4).

- You show time series from five stations in Fig. 2, but focus on only four stations afterwards. Please state explicitly in the text why you do not include further analysis from the remaining station.

- The title and abstract indicate general results, but most findings are based on a case study for one of the CTW events in October-November 2014. The provided evidence of the case study is not sufficient to make general conclusions. Why did you not analyze all events you identified using the wavelet analysis? This would strengthen the manuscript. The use of composite figures could help to visualize results. If you choose to not extend your analysis, be more clear in that your conclusions mostly are based on a case study - this should be reflected in both the title and abstract.

- L205ff: This section would benefit from a discussion of context from existing literature. In the introduction, you mention some relevant papers. Some of that information could be moved here and compared to your results.

- L222-225: These are general results for which no robust direct evidence is provided in the manuscript. In L225 you mention that this occurs more often, but this is not shown or mentioned where you present the results.

- L229f: The exponential decay is something we theoretically expect (here it sounds like a statement from the literature). You can connect this to your results by discussing this explicitly in Section 5 - the strongest velocities and highest sea level anomaly are found near the coast according to Figs. 9-10.

- L234: This is interesting, but you have not mentioned the intensification of the Black Sea mean circulation during winter before. Are there any references or observations to substantiate this statement?

Technical corrections

- Fig. 1: Please add a schematic arrow of the Black Sea cyclonic boundary current to the map and add labels ($^{\circ}\text{N}/^{\circ}\text{E}$) to the axes.
- Fig. 2: The time series look rather smooth for being in hourly resolution. If the data were filtered, please mention this in the caption and methods section. Please add labels including units to the y-axes.
- Fig. 3: The caption states that these are spectra from all five stations, but only four panels are shown. Could you indicate some level of statistical significance? Consider also adding a second x-axis on top of each panel showing the period in days, as this is what you mostly refer to in the text. It would also be helpful if you could mark the main periods, for example by using a background shading.
- Fig. 4: Please specify that the unit for Period is days.
- Fig. 5: Please add labels including units to the y-axes (or title).
- Fig. 6: On the y-axis, please use period not comma to indicate decimals as in the rest of the manuscript.
- Fig. 7: I strongly recommend to avoid use of a rainbow colormap like Jet. See e.g., Crameri et al. (2020), <https://www.nature.com/articles/s41467-020-19160-7.pdf>. Please also add a space between speed and (m/s). You could consider shading the background for the period 24-27 October, which you discuss in more detail in the text.
- Figs. 8-10: Please indicate the locations of Ä°Ä±neada and Amasra, which you mention directly in the text when discussing these maps. (You could maybe even indicate all five stations as in Fig. 1.)
- Fig. 9: Please clarify the caption ("mean sea surface height" vs. "SLA" in the color bar label).

- Fig. 10: You could consider plotting fewer (larger) arrows to enhance legibility.

- L14f: could remove "the process"

- L17: current joins "the" large-scale

- L18: evidence "of" the influence

- L14-16: You mix tenses ("CTWs were formed ... CTWs generate"), be consistent. Use present tense for general results and past for specific observations. (This links to the concern regarding how general your observations actually are, see above).

- L18: hyphenate: "large-scale" circulation

- L21f: who obtained "a" trapped wave solution "for" fundamental mode edge waves?

- L28: This (and not L54 or L68) is the first occurrence of "coastal trapped waves", introduce the abbreviation CTW here and use it consistently afterwards.

- L29: "Japanese coast, and as low-frequency long waves"

- L38: remove "as" before Continental Shelf Waves

- L41: "the" generation

- L41: unclear whose model you refer to here

- L43: topography with "a" coastal boundary

- L44: remove the "as" before coastal trapped waves
- L50: have "the" (or "their") maximum amplitude
- L50: reword to clarify that "decays" refers to the amplitude, not the CTWs
- L65: remove "the" before coastal trapped waves (which should be "CTWs") at the end of the line
- L68: "their role in the dynamics"
- L73: add a space between m and s^{-1}
- L77f: Clarify. What about: "due to the coastline with topographic variations, which likely leads to the formation of anticyclonic eddies downstream"?
- L81f: "a" primitive equation model and "a" general cyclonic circulation; also, the model itself does not find something, so perhaps "and found" such that this refers to the authors of the study?
- L85: "elliptically shaped"
- L93: "northwestern"
- L99: "observational data sets"
- Please be consistent with the use of "data" as singular or plural word ("is" vs. "are").
- L119: move the citation into the sentence (before ".")

- L122: "the" amplitude

- L141: "the" weather band

- L148: There is no need to introduce the abbreviation CWT as it's not used afterwards.

- L149: remove parentheses around citation

- L166: "occur"

- L170: "are indicative", "CTWs"

- L178: "The wind speed"

- L179: "recurrence of northerly winds, alternating ..."

- L182: "southerly winds"

- L197: Please be consistent with the use of dates throughout the manuscript ("October 25" vs. "25 October").

- L207: "some parts near the northern boundary"

- L208: "in the western"

- L217: "are analyzed to reveal" sounds contradictory, you could simply use "revealed"

- summary/conclusions: Please use the past tense when referring to your specific results (i.e., "had a 20 cm range", "were demonstrated", ...)

- L231: "currents" or "a current"
- L232: "The Black Sea rim current"
- L232: "comes closer"