EGUsphere, referee comment RC2
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Comment on egusphere-2022-495

Anonymous Referee #2

Referee comment on "Surface circulation in the Gulf of Thailand from remotely sensed observations: seasonal and interannual timescales" by Arachaporn Anutaliya, EGUsphere, https://doi.org/10.5194/egusphere-2022-495-RC2, 2022

The paper introduces a discussion about the GoT surface circulation using remotely sensed data. The impacts of monsoon wind as well as those of ENSO and IOD on GoT surface circulation are discussed. Complex EOF and correlation analyses were used to investigate the drivers of surface circulation patterns. Seasonally, Complex EOF showed that about 28% of changes in surface circulation were attributed to the monsoon wind reversal. On interannual timescales, ENSO and IOD have spatially varying impacts on surface circulation with ENSO influence being more pronounced in the GoT interior whereas the GoT western boundary responds more to IOD conditions as evidenced by correlation analysis.

The paper is fairly well written. It introduces an important topic that can benefit a larger community to understand the impacts of climate on surface circulation and the extension to biogeochemical processes. However, there are a number of improvements that can help build a stronger case.

- The significance of the study should be emphasised. Besides the use of field observations and numerical modelling to study the surface circulation of GoT, previous studies also used remotely sensed data but findings did not converge. So, what makes the application of remotely sensed data in this study relevant. Also, most of the remotely sensed data used in this study were available from the 90s but the analysis only focused on the period starting from 2014. Why?
- In addition to datasets section, please also add a methods section. Most of the statistical analysis used were neither thoroughly explained nor proper references were provided. This is a weakness of the current manuscript. Complex correlation, rms correlation, etc. are not common correlation analysis methods and should be well introduced with proper citation prior to their use. Without such information it is difficult for the reader to make an easy interpretation of results presented. As for the datasets, please include the data source URLs in the datasets section and explanation about the ENSO and IOD data, and their provenance.
- SCAR and ADT data with spatial resolution of 27–37 km were used to discuss surface

circulation patterns in the uGoT. This is a small (~ 100 km horizontally) and shallow area (Figure 1). The author recognises the limitations (L340) but still places a lot of emphasis on the variability of OSCAR current data in the uGoT (e.g., L120, L135, L184, etc.). I would recommend introducing the L340 text earlier and limit the discussion of uGoT surface circulation based on OSCAR data. Please note that the circulation patterns in the uGoT have been discussed using local wind data derived from meteorological stations as a way to overcome the limitations of coarse resolution remotely sensed wind data (Buranapratheprat et al., 2006).

- The sequence of some figures should be revised to make the flow easier. Complex EOF (Figure 3) can be understood with easy after Figure 4 is introduced, and after the method has also been introduced. Similarly, the correlation maps in Figure 8 are better after Figure 9 is introduced which will be in line with the text in L250.

Details

L30: please revise the text for clarity. Numerical simulations were done for uGoT but the spatially uniform wind does not represent that of GoT?

L38: "*The study suggests* an overall cyclonic circulation…" Which study?

L55: better open a new paragraph.

L77: It is helpful to add the locations of the high frequency radar system in Figure 1.

L80: please explain how this comparison was done. How the spatial and temporal resolution differences were addressed? As admitted in L340 the OSCAR data may contain large error there. How to distinguish between the two, large difference or large error?

L90: 20 km is below the ADT spatial resolution. How to know this is not noisy data?

L99-100: references for A and wind stress curl estimation?

L115: why use complex EOF? Does it improve the results over the classical EOF. What (additional) information is gained from the use of complex EOF? Again, these issues can be addressed by a proper methods section.

L120: much of this discussion should be removed from the text. 6 grid points are too rough to have a meaningful discussion. Any derived parameter will even include less grid pixels which further limits the interpretations.

L125: briefly explain the reader how to look at the results of complex EOF. For classical EOF the mode often indicates temporal variability when multiplied by the amplitude. What is the relationship between Figure 3a-c?

L151: reference(s) for the correlation coefficient from non-parametric method?

L165: what is rms correlation? reference(s)?

L171: what is total current? Most of these details should be addressed by a proper methods section.

L224: what is the difference between this correlation coefficient and the other so far introduced?

L227: "…*much of the correlation* is *attribute*d…"

L232*: "Still, the result suggests the importance of coastal trapped Kelvin waves…"* add reference(s) as this is speculative?

L239: add the description (and/or sources) of the *sea surface temperature* and the *Niño 3.4 box* in the text.

L245: as mentioned above, the discussion in this paragraph suggested that the sequence of Figure 8 and 9 is reversed.

L250: "…*correlations between low-frequency Niño3.4 and selected forcings…*". What parameter is the forcing, Niño3.4 or ADT, etc.?

L300: "…*but might relate to the winter warm pool"* where?

L310: the last sentence is long, break it into smaller parts.

Please consider revising the style of figure captions. I think starting with the label followed by the explanation is a commonly used caption style and is easy to read. E.g., Figure 1: Map of the Gulf of Thailand. (a) Triangles indicate the locations of tide gauges: FP denotes Fort Phrachula Chomklao station, KL denotes Ko Lak station, and KM denotes Ko Mattaphon station. (b) Shows the location of the Gulf of Thailand. Colour contours in (a) and (b) represent bathymetry. The black contour in (a) represents the zero-depth level.

Figure 3. I could not locate boxes in Figure 2.

Figure 5. Please use the positive half of the (b) Figure colour palette. On (a) blue corresponds to extreme positive but on (b) the same blue is extreme negative. This can be very confusing.

Figure 6. Same as in Figure 5. Add zero contours in (b) and (d).

Figure 7. sea surface height (black) just needs to be mentioned once. How can a negative wind stress curl have both negative and positive values? I think the point here is that the displayed data was multiplied by (-1) to be in phase with the other parameter? Winds act on a much larger scale, so I am not clear about the point of the correlation between the green cross and triangle.

Figure 8. Non-significant correlation could be masked?

Reference

Buranapratheprat A, Yanagi T, Sojisuporn P, Booncherm C (2006) Influence of local wind field on seasonal circulation in the Upper Gulf of Thailand. Coast Mar Sci 30(1):19–26