

***Interactive comment on* “Estimation of oceanic sub-surface mixing under a severe cyclonic storm using a coupled atmosphere-ocean-wave model” by Kumar Ravi Prakash et al.**

Anonymous Referee #2

Received and published: 8 January 2018

Comments for the manuscript “Estimation of oceanic sub-surface mixing under a severe cyclonic storm using a coupled atmosphere-ocean-wave model”

General comments

This study presents a case study using a coupled atmosphere-ocean-wave model to investigate the influence of the very severe cyclone storm Phailin on mixing in the upper oceanic layers over the Bay of Bengal. An advantage of coupled model, i.e. interaction and feedback between component models, was utilized and mentioned in the study, however, was not highlighted as it should be. For instance, there is a lack of an analysis for wind speed and wind direction simulated by the atmospheric model

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which is an important factor to the mixing and kinetic energy in the ocean during the storm. A case study for one storm event and a time series analysis for only one location in Indian Ocean does not seem to be able to provide robust conclusions. However, the topic is interesting and the introduction provides a good overview about the topic. Therefore, I suggest accepting the paper for publication after major revisions are made.

Major remarks

- Abstract contains too many details which should be moved to the conclusion. Especially in the abstract as well as in the introduction, a clear statement is missing of what is new in this study.
- Configuration (i.e. horizontal resolution, vertical levels, integration time step, etc.) of used models should be provided.
- What is the reason for choosing only one location for time-series analysis? Is there any observation data at this location that can be used to compare with the simulation?
- An evaluation of wind speed and wind direction simulated by WRF is missing although it's relevant for the analysis of D23, MLD, etc.
- The simulated storm track of the stand-alone WRF for this event should be mentioned in the current section 3.2. And how is the performance of stand-alone ROMS in simulating mixing during the storm? One can ask whether the expensive coupled model is really necessary to simulate such event.
- Simulated SST should be analyzed in more details. Although the cooling was captured well during 12-14 Oct but obvious biases occur in 10 and 11 Oct. What is the reason for the biases?
- Conclusion section: for which studies the results of this present study can be applied? Please give examples!
- There is a lack of references at some parts of the manuscript, for instance for the data

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sets ECCO2 and ETOPO2 (lines 152, 153) or for the periodogram and Morlet wavelet methods (lines 160, 161). - The English needs strong improvements. I suggest proof reading by a native English speaker.

Minor Comments

- It's not necessary to use the abbreviation VSCS prior to Phailin.
- Line 40-41: what are other important factors to drive the ocean response to the tropical cyclone?
- Lines 72-79: The information does not seem to be important for the present study.
- Citation rule of the journal was not kept in line 95, 98.
- Line 118: The simulation time period should be more specifically described, for example "period of 00 GMT 10 October – 00 GMT 15 October 2013" as "period of 10-15 October 2012" can be understood that the whole day 15 October is also simulated which is not the case in this study.
- Line 164: where is E_f defined?
- Section 3.1 is not a result of this study. It should be moved to the line 81, after the storm Phailin is mentioned.
- Line 271: how to define the rotary spectra of near-inertial wave numbers? Either an equation or a reference is necessary.
- Some sentences are not clear: lines 57-60, 238-242, 247-249. Please rewrite them.
- Line 280-284 should be moved to the conclusion and discussion.
- Too many colors shading steps are used in the figures, please use maximum 15 colors in each figure. For most of the respective panels using half of the number of steps is recommended.
- Caption of figure 1: "is" is missing between "analysis" and "marked".

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- Figure 2: It would be good to display the lifetime of the storm (daily should be sufficient) with colors of dates corresponding to the tracks. It will be helpful to see when and where the storm was generated and vanished.
- Caption of figure 2: “Validation” is not necessary here. Can change to: “The Phailin track simulated by the coupled model (black) and the IMD reported track (red).”
- Caption of figure 3: Sequence of upper and lower panels should be switched. For instance: “Daily SST (oC) simulated by the coupled model (upper panel) and observed from the AVHRR satellite (lower panel).”
- Caption of figure 4: “(d)” is missing
- Figure 5: which time period is covered?
- Figure 6: where is the white dashed line?

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2017-83>, 2017.

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