

Interactive comment on “Mesoscale processes regulating the upper layer dynamics of Andaman waters during winter monsoon” by Salini Thaliyakkattil Chandran et al.

Anonymous Referee #2

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Comments on the paper entitled “Mesoscale processes regulating the upper layer dynamics of Andaman waters during winter monsoon.

September 3, 2018

The manuscript aims to characterise a set of mesoscale eddies in the Andaman Sea and relate their formation to the incidence of Rossby Waves propagating within this basin. The authors have done an extensive amount of work, analysed a variety of datasets, and reached several conclusions. It is clear that the authors know several analysis tools and have technical skills. However, there is no cohesion in the manuscript.

I noticed that there are several separate analysis, tied into one story in the manuscript. However, this story still requires a lot of work. Most of the time, the authors are describing events of different spatial scales and trying to relate them (e.g., sub-mesoscale coastal processes and mesoscale oceanic eddies). I could not identify the knowledge gap this paper is trying to fill. I suggest the authors to identify the key message they want to convey to the reader - and to clearly identify in the manuscript what are the main contributions to their field. Not all the analysis done in a project have to be included in a manuscript. The results contained in the manuscript should all act as a

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support for achieving the goal proposed in the Introduction.

I suggest major revisions are made before this manuscript can be considered again for submission. I truly hope that my comments help.

1 Major Comments

1. Observation-based analysis (Figs 2 and 3): I'm not convinced you sampled an eddy in the stations you show. Yes, there is some northward flow to the west and some southward flow to the east, but it is hard to confirm it is an eddy on not only a current interacting with the continental shelf. The SSH map cannot confirm this is an eddy - it does not resolve this scale (only features that are larger than 110 km in radius)
2. Even if you still think that the ADCP data and the SSH maps indicate the presence of a sub-mesoscale eddy, this eddy is anticyclonic (clockwise rotation in the northern hemisphere). Therefore, all the discussion and data interpretation that points this eddy as being cyclonic is erroneous (e.g., lines 144, 152). Please, re-interpret your data keeping this in mind.
3. I could not understand why the authors show the vertical sections of T, S, and density only down to 200 m in Figure 2. If these variables were sampled by the CTD, I would expect deeper measurements. If you look at values below 200 m, you might get more insight about the structure you sampled.
4. Still about Figure 2: the max and min values in the colour axes in (b), (c), and (d) are not appropriate. This choice might be hindering some isolines above 40 m. Please review this figure.

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5. I could not understand the advances this manuscript brings to the Rossby Wave propagation and eddy triggering to the literature. Please state it in the manuscript.
6. I was not convinced that the Rossby Waves indeed triggered the eddy. You need more results to support this claim. The whole section on "Generation Eddy Mechanism" needs thorough review and more results to confirm your claims. The statement in lines 218-220 needs proof to be accepted.
7. Figure 6 shows higher [chl_a] close to the islands. You claim this is because of eddy effect. It just looks like it is a natural coastal increase in nutrients (river runoff, upwelling, current-bottom friction). Is this region of the world different, and these processes would not be in place?
8. Figure 8 actually suggests an increase in [chl_a] caused by the presence of an eddy. See the spiralling green patch between 11-14N and 85-88E. This might relate to a cyclonic eddy.
9. The part of the manuscript that requires a specially careful analysis and interpretation is the SSHA analysis (Figure 7). The SSH product used does not resolve the features you are trying to investigate. You need to zoom out to look at the mesoscale eddies. In addition, an eddy is defined by a closed SSH contour. You cannot see this in any of the features you indicate as "eddies". All the paragraphs in the manuscript related to this figure must be intensively corrected.
10. I could not comment on the biogeochemical results (Table 1) and in the wind stress results because they are not presented in a suitable manner. Please make a figure with the values in Table 1 and a figure with the wind results if included in the next manuscript.
11. The domains you look at in Figures 1, 2, 6, 7, and 8 are all different in space - and probably in time (but I can't tell because this information is not given). You cannot

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discuss the "eddies" from these different datasets as you do here because they are not the same ones!

2 Minor Comments

1. Latest manuscripts in our field are written in active voice - it is more engaging for the reader and it helps to transmit your information clearly.
2. Choose a verbal tense and stick to it. Usually, the manuscript is written in the present tense, with Data and Methods section written in the past tense.
3. The goal of the manuscript is missing in the abstract
4. The usage of the term "vertical current" is wrong (see lines 8, 139, 175 for example). This term relates to the w component of the current - which is not the case here. Please re-phrase.
5. The introduction needs to be re-structured. Usually, Introductions go from the "big scenario", to the "small scenario", to the knowledge gap you are trying to fill.
6. Lines 42-44 ("Explanations have come ..."): Is this the contribution of this manuscript or something reported in the literature? This is a case where the use of active voice helps.
7. Lines 50-52: does this relate to Andaman eddies or eddies in general?
8. Lines 61-63: does this relate to Burnaprathepart 2010 eddy or to the eddy you describe in this manuscript?
9. In the Data and Methods section, you should only include what you used in your manuscript. For example, you did not analyse AVISO data between 2003 to 2013.

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You only showed some certain days. You also did not use the meteorological information (lines 72-74) and solar radiation information (lines 97-99) here, so no need to say you collected it.

10. Lines 86-88: this paragraph does not inform the reader about the local bathymetry. you should remove it and add the bathymetry in Figure 1.
11. Please describe in the manuscript the reason for working with the weekly AVISO dataset, instead of the daily product.
12. Line 107: Before describing the wavelet analysis, it helps the reader if you write a brief line saying what you use it for later on the manuscript.
13. Line 122: Physical characteristics of an eddy is not the same as eddy dynamics. You do not approach eddy dynamics in this manuscript.
14. Line 130: missing citation to paper that defined Bay of Bengal waters
15. Line 151: The figure does not show this is a sub-surface cyclonic eddy. You are not resolving this feature neither in the horizontal direction or in the vertical direction.
16. Line 244-247: The fact that the eddies are propagating eastwards are not shown in your figure - and is also hard to agree. Eddies tend to propagate westwards, unless when advected by a strong flow.
17. Line 254: anticyclonic eddy
18. Lines 307-316: This paragraph again describes results related to Rossby Waves. Could you merge this paragraph to the previous one that discusses Rossby Waves? This would help readability. In addition, merge Figures 4 and 9 and discuss them together.

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3 Figures and Table

- Figure 1: Please add a larger map indicating the location of this archipelago in context; add the regional bathymetry.
- Figure 2: The SSH data shown in (a) does not resolve your feature shown in (b-d). You can still show this SSH map, just to show the oceanographic context of the region at the time of sampling - but zoom out to show more - and a map of SSHA better shows mesoscale eddies; your circle in (a) does not coincide with your sampling location; say when is this SSH map from; please review isolines and axis limits in (b-d); if data is available below 200 m, show it - if not, say in the manuscript why you stop at 200 m; show the location of the stations in (b-d) for the reader to know how much interpolation is happening in this figures.
- Figure 3: This is not vertical current; these are horizontal (or maybe only meridional or zonal?) currents at three different depths; add x-axis indicating longitude.
- Figure 4: indicate which data you use to build this diagram (Aviso); merge this figure to Figure 9; include units.
- Figure 5: indicate which data you use to build this diagram;
- Figure 6: Is this data from one day? Is this a composite? indicate where is this data from, and the time period shown.
- Figure 7: Are these from one day for each month? Are these means? Indicate where data is from; you cannot say that your CE3 and CE1 labels relate to eddies, because you are not showing the closed contours - zoom out to check; label CE2 might relate to a very small anticyclonic eddy (positive SSHA and clockwise rotation in the NH) - not cyclonic.

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- Figure 8: Are the SST values shown here for one day? are these combined maps of chla? The T values are very hard to see - increase label font.
- Table 1: This table does not help the reader and does not provide any useful information as it is - please make a figure to show these values; specify "eddy region" in the caption.

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