

***Interactive comment on* “Evidence of eddy-related deep ocean current variability in the North-East Tropical Pacific Ocean induced by remote gap winds” by Kaveh Purkiani et al.**

Anonymous Referee #1

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Evidence of eddy-related deep ocean current variability in the North-East Tropical Pacific Ocean induced by remote gap winds

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General comments: In this study the impact of eddies on the variability of deep ocean currents is investigated in the northeast tropical Pacific Ocean by using a combination of satellite and in situ observations. The studied region is one of the most eddy-rich regions in the world ocean, where eddies are generated by remote wind gaps in the Sierra Madre mountains. This region is of special interest as the interest of deep-sea

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mining is increasing. The main strength of this paper is to propose a thoroughly study of the main parameters of eddies and their spatiotemporal variability. My main concern is that the presentation of the analysis of the interaction between the EKE in the gap wind region and the EKE in the study region of the open ocean is not precise and that results are difficult to follow. A more carefully and detailed description of the analysis is lacking. I therefore recommend publication of this manuscript after major revision. I will leave my questions in the specific comments.

Specific comments:

L103: “July 2013 and April 2016”: This period does not agree with the figure caption of figure 11b, which indicates to show data from April 2013 to May 2016. Please clarify.

L107: The mooring was deployed for three years between 2013 and 2016. Now you talk about four years (“60 min during the first year and 45 min during the following three years”). Please clarify.

L109: “20 March to 2 June 2015“: This period does not agree with the figure caption of figure 10, which indicates a mooring period from 20 March to 2 July 2015. Please clarify.

L109: Please add the geographical location of the mooring.

L168: The swirl velocity is mentioned in chapter 3.2 as well as in chapter 3.5 “Translation speed and swirl velocity of eddies”. Unfortunately, I could not find anything about the swirl velocity. I think it could be quite important concerning the lifetime of an eddy.

Figure 1: I would recommend to remove the EKE for the Atlantic Ocean in Figure 1 and 2. Figure 4 shows the zonal variability of meridionally averaged EKE and one might think that the EKE of the Atlantic was taken into account.

Figure 4: According to Figure 2 the regions TT and PP are at about 95°E and 85°E , respectively. Why is it shown at $\sim 98^{\circ}\text{E}$ and $\sim 92^{\circ}\text{E}$ in Figure 4?

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L226: Why don't you choose the median eddy radius?

L235: There is no word about the swirl velocity, although it is even mentioned in the title. Please add information/estimates about the swirl velocity.

L267: It is not a surprising statement that the distance of eddies increases with their lifetime. Please rephrase or skip the sentence.

Figure caption of Figure 7: The last sentence is misleading. Please rephrase.

L275: I would recommend to calculate the annual mean for the period from July to June for each characteristic eddy parameter as El Nino/La Nina events show their peak during the turn of the year. Sometimes an El Nino year is followed by a La Nino year, which means that an annual mean from Jan-Dec would cancel the anomaly.

L287: I don't understand the last part of the sentence as the EKE at TT seems to be even more related to EL Nino events. Please clarify.

L323: I cannot see a tilting of the currents to a northward direction on 12 April, it seems to be rather on 22 of April in 406 m a.b. and on 25 April at 6m a.b..

L327: At the end of March as well as at the beginning of April, there is also a strong deviation of the current velocities. The reverse of the deep current from a southward to a northward direction occurs with three weeks after the time of maximum SSH showing a strong time lag between the passage of the eddy and the response of the deep current.

L393: Why do you calculate the correlation between the EKE at TT and SR from the annual cycle over 24 years and not from the time series for the whole period from 1993 to 2016?

L394: The lag of 224 is not clear to me. The peak in the vicinity of the TT region occurs in December. The maximum of the EKE in the SR occurs in April, which means a lag of 120 days. Please clarify.

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L400: It is not clear to me, why monthly mean current velocities are used instead of the time series for the whole period of three years. Please explain.

L400: “four years from April 2013 to May 2016“: It should be three years. Please correct.

L408: “four years“. Should be three years.

Figure 11: Do you show northward velocity? In Figure 10 the current velocities show a southward current except for the passage of the ACE. Please clarify. Units are given in mm/s and in cm/s. Please, choose consistent units.

Technical corrections: L2: Better: “world ocean”

L10: typo: correct “that” into “than”

L32: typo: correct “kilimeters” into “kilometers”

L110: Usually, the figure number should be sorted by their order of appearance, which means that Figure 10 should be Figure 1.

L113: typo: correct “products” into “product”

Figure 1: The indication of a), b), c), d) is missing in the figures. It is not immediately clear which season is shown in which figure.

Caption of Figure 4: typo: delete one “period”

L241: The translation speed should be uniformly given to one decimal place.

Table 1: Please add the information in the caption, that this table only includes statistics about ACEs.

L254: The time interval of 37 days does not agree with the numbers in table 1.

Figure 7: The location of eddy generation is difficult to recognize, especially the ones that are coloured in yellow and orange.

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Figure 8: typo at the label of the y-axis: correct “ifetime” into “Lifetime”. Hyphens are missing at the label of the colorbar. Please add hyphens. Indication of a)-d) is missing in the figure caption. Please add a)-d).

L323: typo: correct “North” into “north”.

L328: typo: correct “soutward” into “southward”.

Figure 9: 9a shows different y-axis scales.

Figure caption of Figure 9: Please indicate that TT is black and PP is red in the figure caption.

Figure 10: Figure 10f is very small, hard to see and does not give any new information that cannot be obtained from Fig. 10a-d. I would recommend to drop Fig. 10f.

L431: typo: correct “describes” into “describe”

Figure 11: In Figure 9, the EKE in the TT (PP) gap wind regions is shown in black (red). In Figure 11 it is the opposite way round, which is confusing on first sight. Please plot the EKE of TT and PP in the same colour each.

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