Ocean Science
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Discussions

Interactive comment on "Sea surface height and mixed layer depth responses to sea surface temperature in northwestern Pacific subtropical front zone from spring to summer" *by* C. Qiu et al.

Anonymous Referee #1

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This manuscript analyses the relationships between SSH, steric sea level (derived from net air-sea heat fluxes) and MLD in the Pacific subtropical front.

While the topic is of interest for the ocean community, I believe that requires many formal and substantial improvements before being published. Therefore I cannot recommend its publication in the present form, and ask the authors to provide a major revision of the manuscript.

In particular, I found the language poor and full of mistakes and typos, from one hand. On the other hand, the analysis is not particularly original, often reduces to an enumeration of results without an interpretation/understanding and there is lack of strong

conclusions.

General Comments

Data and methods: 1) It is not clear why Argo data are not used to estimate the MLD, especially because the period is from 2003 onwards and because the authors use a fine grid (1/8 resolution). Neglecting Argo data seems improper at this stage. It is also not clear why the steric sea level is estimated only using net heat flux (approximate formula) and there is no attempt to use in-situ data, which are only used for MLD estimation.

Results 2) Section 3.1 looks much too an enumeration. Once would expect to understand why the front location has different variability depending whether it is on the western, central or eastern part of the area study.

3) Results presented in 3.2.1 seem not commented/explained. Actually they are quite obvious: the EOFs analysis that uses monthly or sub-monthly data will certain provide the seasonal cycle as principal component / first mode. It is very intuitive that the variability of SLA and SST follows a meridional gradient and its dominant component is the seasonal one.

4) By introducing Section 2, the salinity effect on steric sea level is neglected. The authors should at least discuss this issue

5) There is a lack of explanation, discussion and interpretation of results. For instance, no attempt in explaining (Figure 5) the different steric/SSHA cycles in the three zones. The reader does not understand eg if it comes from an approximation in the steric sea level, or it responds to a variation in the barystatic term of sea level.

6) Again, the high correlation SSH-SST and SSL-SST is quite obvious because it is dominated by the seasonal cycle. This applies to most ocean regions, and also to the global mean sea level. There is no clear implication on the weakening of the subtropical front

Specific Comments

Pacific Ocean is never mentioned in the Abstract,

Figure 1 is never mentioned in the text.

P85L27: AMSRE data are available from 2002

A discussion/reference on the use of 0.6 degC as MLD temperature criterion is required since it appears relatively large

The resolution of the grid used for analysing the data (1/8) seems much finer that the signal provided by altimetry and insitu data. The authors should discuss/justify this choice, as it would be more obvious interpolating all the data to a coarser grid

Typo

P84L4: investigate instead of investigated; sea level anomaly (without "the")

P84L25 use "exchanges"; also the sentence is not complete, eg "sea surface height VARIATIONS", and needs a full stop P85L4 : geostrophic

P85L14: deepening instead of enlarge

P85L14 induces

P85L16 "We need to check..." this sentence sounds weird and needs rephrasing

P86L2: data processing DESCRIBED

P86L3: The sentence "AMSRE has no seasonal variation" does not make sense. Perhaps "AMSRE has no data gaps and therefore is suitable for investigating seasonal variability"

P86L14 summing, not summarized

P87L4 and many other occurrences: please use the simple present and not the past

P87L8: "locations" instead of part

P87L25 "relatively" instead of relative

P88L3: indicates instead of represent

Equation 1: it is better to consider than anomalies and state clearly in the text that the three components are anomalies wrt to the mean state

P88L15 "cp" is described here but introduced later in Equation 2