This manuscript describes the relations among SST, SSH and MLD in the northwestern Pacific subtropical region and its SST front zone. Though the selected topic for study by the authors is important, discussions, interpretations, supporting evidence and conclusions are quite confusing and vague. I am of the opinion that the manuscript is not suitable for publication.

RE: Following your valuable suggestions, we made major revisions:

(1) Calculate the steric heaight anomaly using in situ GTSPP data, and results are shown in Figure 3.

(2) We removed seasonal cycle of SLA using high-pass filter, and results are shown in Figure 6.

(3) We analyzed the monthly evolution of MLD, and the relationship between MLD and SST among three different zones. Results are shown in Figure 7-8.

(4) We rewrote the Summary and Concluding parts.

(5) We got text check help from text-check Company.

General Comments:

1) The subtropical front zone is not clearly defined. Is it subtropical SST front zone?

RE: Since the subtropical front zone had been defined in Qiu et al.(2014), we added this sentence in the caption of Figure 1,' The black box is the subtropical front zone defined by Qiu et al.(2014).'

2) The manuscript describes the variations for all seasons but the title shows otherwise.

RE:Our target is the weakening of SST front period as shown in Figure 6, but we need to deal with all seasons before we focus on heating season.

3) The periods and resolutions of data are not in uniformity.

Corrected.

4) The manuscript emphasizes only on the weakening period of the front zone. What is the rationale?

RE: This work extending the study of Qiu et al. (2014), in which we discuss the importance and mechanisms of the weakening of SST front. But we left the variation in MLD and SLA during the SST front weakening period. The oceanic currents were

minor compared with net heat flux in the weakening period (Qiu et al., 2014), but the evolution of SLA and MLD are very important. Therefore, we emphasize the weakening period of SST front in the present study.

There is lack of proper physical interpretations in a numbers of derived parameters.

Thanks to your valuable suggestions. We made revisions in each paragraph.

6) The linear relationship derived is not robust, as it shows poor correlation in the warm sector and does not indicate the applicable area of this relationship.

RE: We separated the study area into three zones. The linear relationships differed among the three zones. The poor correlation in the warm zone is suggested to be related to the oceanic currents. We added sentences in Line 205-214:

'The warm zone located in the area of subtropical countercurrent field reported by Kobashi and Kawamura (2001) contained three branches of geostrophic current. These suggests the possible significant influence of oceanic currents on SLA in the warm zone. In the cold and front zones, SLA cycles were dominated by steric height, which was induced by air-sea heat balances. But in the warm zone, SLA cycles were not related to the steric height anomaly, and were possibly induced by oceanic currents. A strong subtropical countercurrent occupied the warm zone (Kobashi and Kawamura, 2001; Qiu and Kawamura, 2012), which further suggests that variation in SLA is induce by the oceanic current in the warm zones.'

Specific comments:

1. Introduction

Paragraph 3: "…MLD is associated with the SSH variation, because SST…" The whole paragraph is not properly elaborated. For example, how could SST cooling induce convection? Also, how could convection deepen the MLD?

RE: In Page 264 of book entitled 'The Turbulent Ocean' by Thorpe, a detailed mixing process is illustrated. SST cooling induces a increase of surface density,

leading to an unstable upper layer and subsequently a convection. The descending water in convection folding the isopycnal surfaces, and induce upward transport of denser water into mixing layer.

2. Data and methods

Page 85: "We use … from 1 January 2003 to 31 December 2009". Page 86: "The data from 1 January 2003 to 30 September 2009…" Why are the data periods different?

Corrected.

Paragraphs 1, 2, 3: "The original spatial resolution is …10 km,…etc." What is the reason for using data of different resolutions?

RE: The AMSR-E level 2 products are not gridded data, that is to say, sometimes the sample interval is >10 km and sometimes <10 km, therefore, we gridded the data into 0.125 data.

3. Results and discussions

Section 3.1, paragraph 1, lines 3-4: "The SST front …next June …" should the next June be the following June?

Corrected.

Same section, paragraph 2, line 5: the subtropical front and Kuroshio front are of different metrics. How could they lead to the different seasonality of front position?

RE: Following your suggestions, we added sentences in Line 119-123:

'Subtropical waters are influenced by the path of Kuroshio Current, and in some years, the Kuroshio mean path entered the western and eastern parts of our study area (Figure 2 of Sugimoto and Hanawa, 2014). Therefore, the different patterns of seasonality of the frontal position may have been induced by movement of this current's path.'

Same section, paragraph 3, lines 3-4: "…with shifting …area ±2" There is no unit attached. Also, the shaded band is not clearly defined (within ±2 standard deviation?)

RE: The shaded band indicates the envelope of the standard deviation of frontal position.

Section 3.2, paragraph 1, and line 4: "…which might result from the study region and study period …" can it be due to different study regions and periods?

Corrected.

Same section, paragraph 1, lines 6-7: "In summer, the SLA has …" Please explain and elaborate with Figure, if any.

RE: From EOF analysis $SLA(x, y, t) = SLA(x, y) \times SLA(t)$. For the first mode, the SLA(x,y) in cold zone is negative in Figure 4(a), and the SLA(t) value is also negative in Figure 4(e). Therefore, the SLA has a positive value in cold zone.

Section 3.2.2, paragraph 2, line1: "During the SST front weakening …" what is your main reason in emphasizing occurrence only during the weakening period?

See question 4.

Same section, paragraph 3-4: There is a mismatch of the time frame used here with that in the title of your manuscript.

RE: To estimate the time integration of steric height, we have to calculate it during all the time.

Same section, paragraph 5, lines 5-6:"…The correlation between SLA…,0.38 in …and warm zone,…" your warm zone shows poor correlation. So, if a linear relationship is being derived then one should specify the area in which this relationship is applicable.

See question 6.

Section 3.3, paragraph 3:"…the singular points …" How do you define singular points? What is the significance of the singular points?

RE: Line 241-242: Note that some singular points (within the red circle), were located outside the range covered by standard deviations of y - (-4.46x + 156.47))

4. Summary: The summary is too brief and vague.

RE: Thanks for your valuable suggestions, we corrected in Line 256-272:

'We investigated the variation in SSH and MLD and their relationships with the SST

front in the North Pacific subtropical area, using satellite altimeter SSH, AMSR-E SST, and *in situ* GTSPP data.

We separated the study area into cold, front, and warm zones. The strong seasonal cycles in SSH were dominated by steric height in the cold and front zones. A weak seasonal cycle in SSH appeared in the warm zone. During the period of SST front weakening, the correlation between SLA and SST was 0.76, 0.76, and 0.38 in the cold, front and warm zones, respectively. After removing the seasonal cycle, the amplitudes of SSH were small in the cold and front zones, but large in the warm zone. The large magnitude in the warm zone may possibly be explained by the subtropical countercurrent. The SSH achieved a balance between the cold and warm zones in mid-summer, which weakened the subtropical countercurrent.

MLD decreased with increasing SST, which appeared as a reverse proportional function in the cold zone and a linear relationship ($y = -4.46x + 156.47$) in the front zone. This relationship suggests the feasibility of retrieving MLD from satellite-derived SST products. The different patterns of variation in MLD among different zones possibly increase the rate of the weakening of the SST front.'