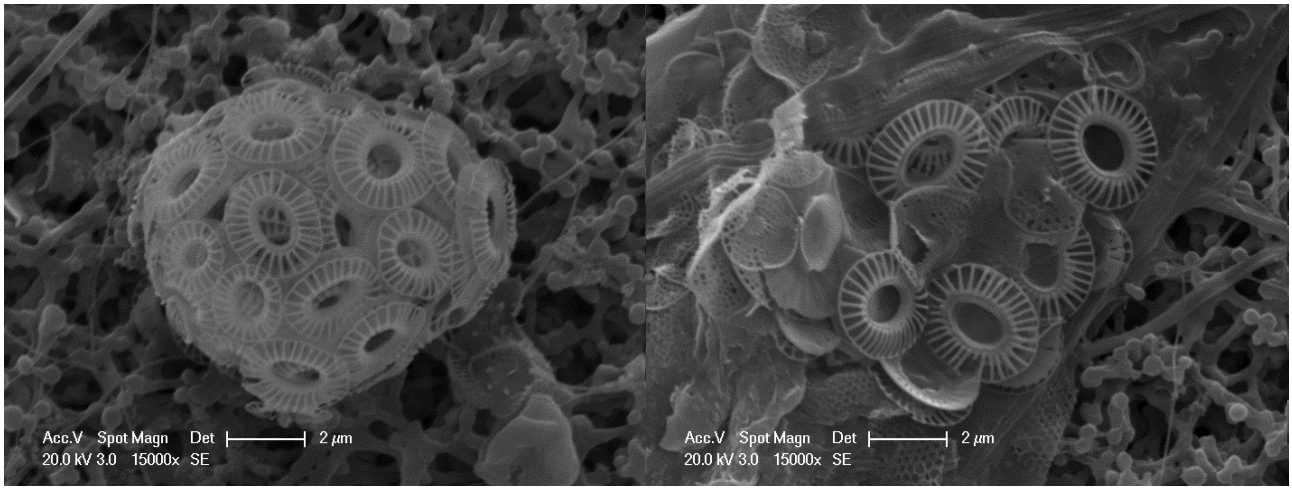
Reply to Referee#1

We would like to thank the anonymous reviewer for the pivotal comments to make the MS more rigorous.

Lines 24-25 of Page 3; I think this is the first study that found *E. huxleyi* Type B from tropical-subtropical water, although several previous studies reported Type C or B/C from warm waters. I think it is worth to add some information on surface/vertical distribution of Type B E. huxleyi in the studied area.

Reply: Really apologize for mistake. I have attributed all the non-type A morphotypes to "type B" as its derivative, as they are showing the similar features: delicate elements and non-grilled central area and the similar ecology: cold water preference. They mainly comprise type B, B/C and C, differentiated by their distal shield length. The morphotype we found can belong to type C according to Young et al. (2003), or type O? which is characterized by the open central area (Hagino et al., 2011). This mistaken has been revised in relevant sections.



Owing to the low magnification (×5000) of the SEM images got in NOC, I have re-taken some SEM images of the rare morphotype at higher magnification (×15000) to show the coccolith structure more clearly. The sample was obtained during the same cruise in the South China Sea. (B8, 50 m, 120 ℉ 20.5 ℃)

Left: type C (O?), coccosphere

Right: type C (O?), detached coccolith

Line 39 of the Page 3; coccolithophore not coccolith

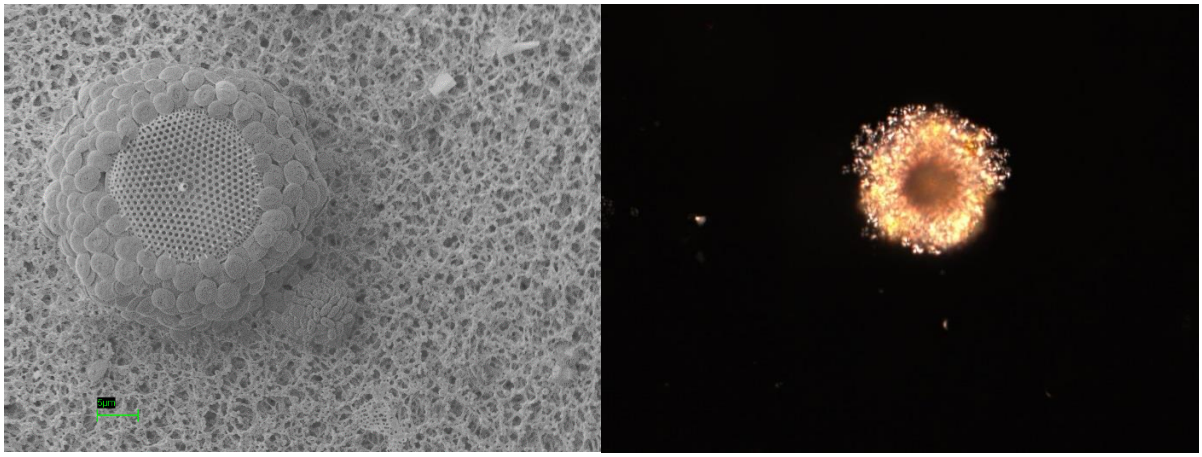
Reply: Revised.

Line 29 of the page 6; Spell out genus name of *Gephyrocapsa ericsonii* and *Oolithotus fragilis*.

Reply: Revised.

Line 31-32; *Reticulofenestra sessilis* was reported from lower/deep photic zone of tropical-subtropical waters (Young et al. 2003).

Reply: Agreement with Young et al. (2003), *Reticulofenestra sessilis* may dwell in relative deep layers of water-column. In the present case in the South China Sea, this species was sporadically found in some samples at the depth of 75 m.



SEM: *Reticulofenestra sessilis* and *Algirosphaera robusta* (H3 75 m)
LM: *Reticulofenestra sessilis* (H2 75 m, located at 19 ℕ 117 ℇ, another station in the same cruise, not included in the present study)

Line 36 of page 6, Lines 5 and 22 of page 7; 'Western Pacific Warm Pool' or 'Tropical Warm Pool' not 'West Pacific Warm Pool'.
Reply: Revised.

Line 21 of page 7 "morphotype A could be related to high sea-surface temperature (>26˚C) of the tropical SCS"; How about the ecological preference/distribution of the Type B *E. huxleyi* observed in this study?
Reply: Apologize for the mistake. This morphotype can be type C or O. Unfortunately, we cannot tell exactly the surface distribution of this morphotype, because it was sporadically found in some samples for its extremely low abundance. Actually, it was found in some samples at ~50 m, where was usually the coccolithophore abundance maximum depth in water-column. One possible reason could be that the high *E. huxleyi* cell density make it possible to find this rare morphotype. Alternatively, this morphotype has a vertical (temperature, nutrient) preference in water-column. As reported by Hagino et al. (2000), *E. huxleyi* type C was just found below the thermocline in the equatorial Pacific Ocean.

Lines 21-22 of page 7; please add some references that explain definition/distribution of the Western Pacific Warm Pool.
Reply: The Western Pacific Warm Pool is the ocean water mass, located in the western Pacific Ocean and eastern Indian Ocean, of which the sea-water temperature is consistently higher than 28 ℃ in a year round (Yan et al., 1992).

Line 2 of page 8; remove ')' after cyclonic.
Reply: Revised.

References

Young, J.R., Geisen, M., Cros, L., Kleijne, A., Sprengel, C., Probert, I., Østergaard, J.: A guide to extant coccolithophore taxonomy. International Nannoplankton Association. 2003.
Yan, X.H., Ho, C.R., Zheng, Q., Klemas, V. 1992. Temperature and size variabilities of the Western Pacific Warm Pool. Science, 258(5088), 1643-1645.
Hagino, K., Okada, H., Matsuoka, H.: Spatial dynamics of coccolithophore assemblages in the Equatorial Western-Central Pacific Ocean. Marine Micropaleontology, 39(1): 53-72. 2000.
Hagino, K., Bendif, E.L., Young, J.R., Kogame, K., Probert, I., Takano, Y., Horiguchi, T., des Vargas, C., Okada, H.: New evidence for morphological and genetic variation in the cosmopolitan coccolithophore *Emiliania huxleyi* (prymnesiophyceae) from the *COX1B-ATP4* genes. Journal of Phycology, 47, 1164-1176. 2011.

Reply to Referee#2

General comments

In most cases, replies to comments satisfactorily treated the general issues raised. However the discussion requires revision in the form. In some cases the changes in the manuscript discussion made it even more confusing (some examples are: P16 L42- 45; P18 L14 - 19). Because of this lack of clarity in the discussion I believe the manuscript is not ready to be published.

According to the MS title, species composition and calcite content are the key parameters under study, but the largest part of the discussion goes to Emiliania huxleyi biometry (already in the introduction is E. huxleyi biometry and not calcite content the main parameters). The discussion of this section (4.4) goes back and forth around the same ideas and should be rewritten so it gets more concise.

Regarding the figures, I think the changes improved the MS. In general, I believe the data set, calculations and statistical work do deserve publication but the discussion has to be improved. Readability should still be improved. English is not my mother language so I did not focus on it, but a revision of grammar will be useful.

We are grateful to the anonymous reviewer for the crucial comments to improve the quality of the MS. The section 4.4 concerning about the influences of nutrient and light on *E. huxleyi* coccolith size has been rewritten. The specific responses are posted as followed.

Specific comments

Abstract:

L15. Perhaps some words on how eddies regulated the coccolithophore community?

Reply: Yes, revised.

Introduction: I agree with the changes.

Reply: Thanks.

Methods:

P11, L22 and 23: Not necessary here.

Reply: Deleted.

L28: "In addition to" instead of "Apart from" or just starting the sentence in "Coccolith length"

Reply: Corrected.

P12, L34: Similarity matrix was constructed with biomass data? It was not explained how biomass was estimated.

Reply: The "biomass data" is the root-square-transformed coccolithophore absolute abundance data (√ (cell/ml)).

Results:

P 13, L35: "these features may indicate lateral transport" instead of "these features may be characteristics of either lateral transport". Perhaps the whole sentence should go to the discussion.

Reply: Corrected. It is also discussed in the section 4.3.

P14, L9: Italics for species name.

Reply: Corrected.

Discussion:

P15, L 15: I do agree it was probably related to the higher temperatures in the sampled area; but insist that this is not proved with the data of this study.

Reply: Agree. That different temperature preference of different morphotype of *E. huxleyi* is not supported in the present data, since the sampling was bounded by the tropical South China Sea in summer. Based on the previous works, we still made some short discussion concerning about the predominance of type A with its relation to high SST in the study area. The detailed examples have been deleted, and it is summarized as "In general … (see text P7. L24.) "

L38: Sentence needs to be re- written, I suggest: Results from nMDS, HCA and eddy settings in the 18 ℃N section clearly showed that…..

Reply: Corrected.

P16, L29 - 31: thus, community composition did not change with environmental factors? In the previous section the differences between the results in cyclonic eddies, anti-cyclonic eddies, and adjacent stations were suggested to be driven by nutrients.

Reply: The community composition did be controlled by environmental factors (light, nutrient). Here, we meant the bulk calcite concentration was not directly controlled by the environmental parameters of seawater, i.e. no statistical correlation. To avoid ambiguity, the sentence has been rephrased.

Same lines: It would be nice to elaborate more on the fact that *E. huxleyi* and *F. profunda* contributed more to water column calcite in cyclonic eddies than in anti-cyclonic eddies. This is not mentioned in the results section.

Reply: The Figure.7 was redrawn, based on which we rewrote these sentences to show the calcite contribution of different taxa in different oceanographic conditions with distinct coccolithophore community.

P15, L 42- 45: I don´t understand "in anti-cyclonic eddies …coccolithophore maximum layers were in group 3" does that mean that some stations in these eddies had a "coccolithophore maximum layer" while other stations did not? And that the first clustered together? Perhaps it refers to abundance instead of layer?

Reply: The "coccolithophore maximum layer" means the maximum coccolithophore abundance depth in water-column. In all stations, there was a coccolithophore abundance maximum depth which was correspondence with the DCM in water-column. Generally, the "maximum layer" was around ~50 m and belonged to the Group 2 (i.e. *E. huxleyi* dominated), however, in anti-cyclonic eddies, the "maximum layer" depth deepened (also correspondence with the DCM), the coccolithophore community in this layer belonged to Group 3. That is, *F. profunda* may represent the coccolithophore production in this subsurface layer. The sentence was rephrased.

P15, L45: "This transition" it should be clearer stated in the text

Reply: Rephrased, since the snap-shot like sampling we cannot tell exactly the transition process. However, it did be found that the different community composition were related to distinct oceanographic settings (i.e. eddy).

P16, L7: "coccolithophore community locations are similar with those in anti-cyclonic eddies" I don´t understand; does it means: environmental conditions or coccolithophores community composition/structure in those stations (I6 and I7) resembled those of AC eddies?

Reply: Sorry for ambiguity. Yes, this is what we mean. The sentence was rephrased.

P16, L45: "coccolith calcite species" I understand what is meant but the term is confusing. It may be better stated as in the comment of the review and the response to this comment (P6, L26 - 28 in the Reply to referee #2)

Reply: Thanks, revised.

P17, L1: please delete "totally"

Reply: Deleted.

P17, L9: I believe the whole section 4.4 should be re-written. The changes done so far did not help the MS. In this section, the argument that is proposed to explain the results stresses the importance of light limitation because nutrient limitation does not explain their results. However: 1) It is very difficult to follow the ideas that cut, come back, are exposed using confusing terms. 2) It goes back and forth around the same ideas: trying to explain why under P - limiting conditions cellular PIC generally has increased in culture experiments, although this is not "the core" of their arguments and could just be developed in one short paragraph. 3) PIC was not determined in this study but rather coccolith- coccosphere sizes and, although these parameters are obviously related, the author passes from PIC to coccolith size and to coccosphere size as equal without warning the reader.

Reply: The section 4.4 has been rewritten.

First, we discuss the *E. huxleyi* coccolith biometry. We think *E. huxleyi* size can well reflect its cell size and cell calcite content. The Fig.9 is added for discussion. Then we have made a caution that coccolith size cannot be compared with other calcification parameters. Thus, following discussion is confined to the coccolith/coccosphere cell size or PIC per cell variation in different environmental/experimental conditions.

Second, in the section 4.4.1 we discuss the influence of nutrient and light on coccolith size and try to interpret our data. In this section, we have removed the improperly comparison between *E. huxleyi* size and calcification rate in the previous MS, and many repeated statements (as the following comments have referred) and some unnecessary parts (as referred in the first vision of comments) were deleted.

L12: "coccoliths size has been show to change under low phosphate..." how? Also, Engel et al. (2005) has been cited here and again in L2 of page 18 with the same purpose, can these paragraphs be synthesized into one?

L15: E. huxleyi calcite quota did not differ between the 6 strains tested in that experiment. The calcification rate did. Meaning growth rate changed in a strain specific fashion.

L16 - 17: This is not a novelty and it was not "revealed" by Aloisi ́s model.

L17: "Phosphorus deficiency" instead of "phosphorus deficient". However, the whole sentence should be reconsider because Aloisi (2015) himself referred to Müller et al. (2008) (and others, please see page 4676). The same issue is raised again in page 18, the newly inserted L14 - 19. None of the two paragraphs (in page 17 or in page 18) are clearly written.

P18, L5: Müller et al. (2008), and Aloisi (2015) did not say that Engel ́s et al. results meant that P limitation regulated growth rate. This is the authors' interpretation.

14-19: It would be better to focus on PIC only and not to mention POC, since the whole discussion should go around coccolith biometry. Thus, parentheses are not necessary.

L19: "different perspective from coccolith calcification (rate)"?

Reply: Since, this whole section was rewritten. Please see details in the revised MS (red words in this section).

L30: "possible" instead of "necessary"

Reply: Corrected.

L32 - 35: that in the North Sea E. huxleyi type A was dominant is stated twice

Reply: Repeated content was removed.

L46: "were of valley values" higher or lower?

Reply: Revised. Ω_C and pH were low during Heinrich event 11.

Conclusions:

P19, L16: "…assemblages in cyclonic eddies were slightly productive." Productive in terms of what? This statement was not discussed.

Reply: As described in the results 3.2, community in Group 2 is characterized for the highest coccolithophore abundance and the dominance of r-select *E. huxleyi*, which could indicate coccolithophore is slightly productive in this group.

Figures:

Figure 4. Please insert “percentage” after 40.

Reply: Corrected.

It was good to combine Figures 5 and 6 into Figure 6.

Can the new Fig. 7 show the different contributions of these species between Cyclonic and Anti-cyclonic eddies?

Reply: As the redrawn Figure 7 has shown the contributions of different species between different conditions, we may not have combined Figures 5 and 6, to show their results separately.