

Interactive comment on “Coccolithophore responses to environmental variability in the South China Sea: species composition and calcite content” by X. B. Jin et al.

Anonymous Referee #2

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The manuscript by Jin et al. presents the results from a detailed taxonomical and ecological analysis of coccolithophores in the South China Sea. The latter may be of great use to broaden the knowledge of coccolithophore dynamics and to calibrate the use of coccoliths as environmental proxies. The sampling provided a complete dataset with a good vertical resolution containing just few gaps within stations. Given the importance of coccolithophores in both, the organic and in-organic carbon pumps, investigating their relationship with seawater carbonate chemistry is particularly relevant in our days. I see this study making a significant contribution to our understanding of coccolithophore distribution and responses to environmental variability, as it includes information on species composition and coccolith morphology against a broad set of

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environmental parameters. However, the current version of the paper needs:

1. A clear separation between cyclonic and “normal” conditions and/or clearer methods to explain how it was done.
2. The effect of temperature and other parameters probably measured during the cruise (oxygen, salinity)
3. Parts of the discussion lack from clarity (please see specific comments)
4. Several figures are poorly discussed (i.e. figures 7, 8, 9).

Specific comments:

Abstract:

L13-15: “All living coccolithophores produced within... eddy centers” please check this sentence, it is long and difficult to understand.

Introduction:

P1.L24: “phytoplankton carbon”? Contribution to PIC is specified but not to POC

P1.L28: Consider (up to 3×10^5 coccoliths ml⁻¹, ...)

P2.L7-23: This paragraph brings out a scientific question that is not answered in this work. The discussion about F. profunda distribution is rather a repetition of the statements presented in this part of the introduction. As this is not the central point of the manuscript and the raised question is not later answered, I suggest leaving the paragraph out of the introduction.

Methods

P3.L20: “. . .around 50 extra FOVs were examined” to reach a minimum of XX coccospheres.

P3.L24: How many coccoliths were counted?

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P4.L3: Please give reference for the ks value of *Florisphaera profunda* (0.0016); in Young and Ziveri (2000) is ~0.04.

P4.L22: "(Fig. 2), altimeter data on...and surface water flow."

P4.L21-23: This is important for the discussion and I think it could be clearer. For instance, Fig. 2 is based on data from the 30.06.2014, but sampling took place from the 20.06 to the 09.07.2014. How was the calculation done for each sampled area? This may be important for the definition of your cyclonic eddy, which shows a SLA close to zero (from Fig. 2) and it might have been a "normal" condition like you assume for stations I1, I6 and I7.

Results

P6.L6: Please consider: water column coccolith calcite concentrations

P6.L11-12: Please consider moving into Methods section. Starting of the paragraph would be *Emiliana huxleyi*...

P6.L19-20: Please consider moving into Methods section. Starting of the paragraph would be: The mean coccosphere...

P6.L24-25: Were there any differences in coccolith size of morphotypes A and B? Was this somehow reflected in the distribution patterns and/or related to environmental parameters?

Discussion

P7.L14-22: How does this relate to the present study? I think it will be better to discuss the possible differences between *E. huxleyi* morphotypes A and B (as previously mentioned), how this relates with temperature and then compare with the data you mention from previous works. Otherwise, the purpose of the whole paragraph is not very clear.

P7.L41: It is clear for surface samples but less clear for deeper samples. There were

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only few samples from 75 m fitting in group 2 and they belonged to both cyclonic and anti-cyclonic eddies.

P8.L36: consider deleting "and calcite contents"

P8.L41-42: You meant that the contribution of the other (potentially larger) species decreased in the deep layers?

P9. Here it will be good to have a short discussion on the effects of temperature P9.L7: "...to change" how?

P9.L8: I am not sure it can be stated that malformed coccoliths have less calcite or even that they are smaller (which may be more relevant for this work). In fact, P limitation did not produce malformation of *E. huxleyi* coccoliths but it tended to increase the percentage of overcalcified (definition based in the spaces between distal shield elements) coccoliths and the coccosphere size (Oviedo et al. 2014). This without a clear pattern in PIC quotas. Also, Langer et al. (2011) reports no consistent correlation between coccolith morphology and growth or calcification rate.

P10.L1-7: This paragraph may be unnecessary because you already explained this "paradox" in page 9 L25 and 26, following Müller et al. (2008). In L5, what do you mean by "maturity under different limitation"?

P10.L28: Triantaphyllou et al. (2010) actually associates the seasonal variation with temperature rather than with nutrients, and thus, I think it would be good to check possible relations with temperature.

P10.L31-32: Please consider changing "assemblages" by "*E. huxleyi* populations"

P10.L32: "...but also in geological records" this conclusion cannot be extracted from the data presented in this work.

Conclusions

The second aim of the study (regarding potential paleo-ecological relationships) is not

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reflected in the conclusions

Table 2. Please check species names

Figure 2. The same station I3 does not show the same structure in the two plots, were the measurements taken in different dates? Otherwise please explain.

Figure 7. Please add the legend for symbols-color codes.

Figures 7 and 8. Figures are poorly discussed. Could they go in supplementary material?

References Jeremy R. Young, Ziveri P (2000) Calculation of coccolith volume and its use in calibration of carbonate flux estimates. *Deep Sea Res Part II* 47:1679–1700
Langer G, Probert I, Nehrke G, Ziveri P (2011) The morphological response of *Emiliana huxleyi* to seawater carbonate chemistry changes: an inter-strain comparison. *J Nannoplankton Res* 32:29–34
Oviedo AM, Langer G, Ziveri P (2014) Effect of phosphorus limitation on coccolith morphology and element ratios in Mediterranean strains of the coccolithophore *Emiliana huxleyi*. *J Exp Mar Biol Ecol* 459:105–113
Triantaphyllou M, Dimiza M, Krasakopoulou E, Malinverno E, Lianou V, Souvermezoglou E (2010) Seasonal variation in *Emiliana huxleyi* coccolith morphology and calcification in the Aegean Sea (Eastern Mediterranean). *Geobios* 43:99–110

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