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Ocean Science Discussions

Interactive comment on "Seasonal and interannual variability of coccolithophore blooms in the North East-Atlantic Ocean from a 18-year time-series of satellite water-leaving radiance" *by* L. Perrot et al.

Anonymous Referee #1

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Title: Seasonal and interannual variability of coccolithophore blooms in the North East-Atlantic Ocean from a 18-year time-series of satellite water-leaving radiance

General comments

This paper describes the use of different remote sensing products to detect and quantify the coccolith calcite concentration in the water column along the western European shelves. This is a useful contribution to the subject. However, the manuscript could benefit from structural reorganization, improved focus, and English language editing.

The analyses of the time series was often merely descriptive instead of quantitative. For example, what general trends if any did the coccolithophore blooms show over the 18-year period? Very little space was dedicated to the discussion of the temporal variability of coccolitophore blooms. Instead the paper often reads as a method development paper (which is fine of course but should be advertised as such). The discussion section includes novel results and does not tackle the results presented in the results section adequately (e.g., Why does the maximum number of coccoliths and SPMfc not coincide in the Celtic Sea area? What is so special about the years 2001 and 2014?). The fact that potential environmental factors such as sea surface temperature, PAR intensity, etc. are not used to explain the temporal and spatial variability of coccolithphore blooms should be mentioned in the introduction section to avoid giving false hopes to the reader (cf. methods paper). The manuscript is rife with typos and inconsistent use of abbreviations and units (e.g., NA-SPM and SPM, Chl and chl-a, liter as l and L; Fig. 10a or Fig.10.a, etc.), which makes it tedious to read. A simple spelling check goes a long way. These errors were for the most part highlighted in yellow in the supplemented pdf. Finally, the abstract does not reflect the goals and results presented in this manuscript.

Specific comments per section

Abstract P1 L9: Evaluating ... P1 L13-14: applied to a spectral radiance time series from SeaWiFS (1998-2003) and MODIS (2003-2015) P1 L14: please explain 'coccolith pixel' P1 L19: .. the extent of the blooms was highly variable and did not show a consistent seasonal or interannual pattern By bloom extent do you mean area covered or SPM concentration? P1 L21: less than half the average? Which environmental variables were used as predictors for the coccolithophore bloom extent? Introduction

P1 L29: calcite (throughout the text) should not be capitalized as far as I know P2 L4: in my opinion ocean acidification by increased pCO2 is a chemical fact not a hypothesis P2 Âű1: the physiological response of calcification to increased ocean acidification and the change of habitat extent due to changes in the physical/ecological environment

(higher surface temperature, more stratification) are probably two separate phenomena. P2 L12: weird sentence construction. 'Evidenced' using in active tense P2 L29: ii- detect coccolithophore blooms based on other proxies than chlorophyll P3 L8 : "we will have a better understanding of the effect of coccolithophores on the non-algal SPM product" this result/goal is not mentioned in the abstract P4 L6 : Northeast Atlantic P4 last Âű of introduction is only two sentences long. This is a very short paragraph indeed ..

Methods

P4 L14&16: "... have been used" for what purpose? Please revicse those sentences and maybe make them active tense. P4 L22: define abbreviation for normalised water-leaving radiance (nLw) and use consistently throughout the text; same thing for chlorophyll a concentration, inherent optical properties, etc. P4 L26: constants defined (see below?) P5 L5&10: is NA-SPM with an underscore or not? P5 L19: in case of coccolith what? P6 L13: the closer the fuzzy index is to 1, ...

Results

P7 L7-8: Revise pieces of sentences to explain what the results are showing. Then point the reader to data in figures. P7 L13: how was the variability of the fuzzy index assessed? P7 L17-18: so does this mean additional number of spectra does not add information with regard to coccolith pixel identification/classification? Is the second sensitivity test dependent on the value of the fuzzy factor? P7 L21: the variability of what? P7 L25: the correlation was significant? (r2=0.89, p=?) thus the use of this time series as continuous is warranted in this case P8 L2: provided an overview of both the coccolithophore bloom's location, areal extent and amplitude.. P8 L8: coccoliths don't bloom, the coccolithophores do P8 L9: progresses? P8 L11: is within the bounds of climatological variability? P8 L30-: this sounds like discussion to me, especially considering that no data is shown to back up this statement. P9 L4-5: could you explicitly mention, for the readers not familiar with remote sensing, that cloud-free pixels

= pixels with radiance data? P9 L7: 2001 does not show anything, but the number of coccolith pixels in the year 2001 does. P9 L23: I assume you want to make sure your signal isn't biased by the data availability and distribution not the effect of cloud-free pixels per se? Is there an overall bias or not? P9 L32: consider moving this sentence upward in this section since it is not related to the results presented just before.

Discussion

P10 L4: Comparison of what to in situ data? P10 L8: a limited number of samples? P10 L14: the concentration of calcite in mg? Carbon maybe? P10 firstÂű: probably more suited for the results section. I also expected some kind of correlation coefficient to have a more quantitative sense of agreement between in situ and remote sensing estimates of coccolith calcite concentration. P10 second Âű: the first part of section 4.2 should probably also be moved to the results section P13 L6: a good proxy based on your results? P13 L8: that particular time in the bloom evolution is at the end of the bloom sequence, when loose coccoliths accumulate in the surface water, possibly due to high N:P nutrient ratios.

Conclusion

P13 L30: this remarkable conclusion was not even mentioned in the discussion section P14 L2: what is meant here by maximum bloom development? P14 L4: was the "discrimination method" defined previously?

Figures

Figure 1: non-algal SPM and calcite concentration. Grid pattern in Fig. 1a looks nice but is busy in Fig. 1b, c, and d.

Figure 2b: label in plot area should be MODIS for consistency.

Figure 3: the latitude labels in the center of the figure are redundant and clutter the figure. Fuzzy index scale bar could be bigger for improved legibility.

Figure 4: what are the straight lines in the plots referring to?

Figure 5: is the arithmetic mean the best way to average the likely log-distributed coccolith calcite concentration data? How would the median concentration look like?

Figure 8: Interannual X-axes labels very small, consolidate to single set of labels in the bottom plot only? Y-axis power of ten and exponent not readable

Figure 9c: using scatter plot may be a better way to compare values of different measurement methods

Figure 11: what are coccolith areas? Surface ocean areas with a coccolith calcite concentration above a certain threshold?

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/os-2016-13/os-2016-13-RC1-supplement.pdf

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