

## ***Interactive comment on “Insight into *Emiliania huxleyi* coccospheres by focused ion beam sectioning” by R. Hoffmann et al.***

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General comments This is the first application of focussed ion beam sectioning of coccospheres and is a remarkable demonstration of the potential of the technique which will likely stimulate further studies. As well as providing a demonstration of the method it contains useful methodological data. One particular application I would like to see is comparative study of type A and type B *E. huxleyi* strains as this method should be ideal for demonstrating the morphological differences between them - and indeed for retrieving the data needed to make 3D models of coccoliths. The extended analysis of coccosphere size and its effect on cell density is valuable both for calcification studies of PIC/POC ratios and for ecological study of coccolithophores. In this respect I would urge the authors to take the final step and calculate sinking velocities as well as

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densities.

I have made some specific comments below and the text is also in need of a detailed revision by a native English speaker.

Given this, however, I think this is an excellent contribution which merits publication in Biogeosciences.

Finally I would note that the movie which is currently in an appendix is well worth presenting much more prominently and if possible as part of the main publication.

Notes on some specific points

p12776 line17 "Clonal cultures of *E. huxleyi* (strain RCC1238) were grown " This is an *E. huxleyi* type A strain (as is clear from the SEMs), it is worth stating this because this technique would actually be a perfect way to demonstrate the difference between type A and type B in terms of coccolith shape in profile. You can probably quote a previous paper of Langer as a source for the identification.

p12780 line7 "in image 1.6 the organic residues are visible in the upper part of the coccosphere." As well as the organic residues an intracellular coccolith can be seen inside the cell. This is fairly clear in figs 1.4 and 1.5 and is confirmed by the video. It is worth commenting on, also since one possible application of the technique would be study of intracellular coccoliths.

p12781 line4 "sectioning was performed at 27 different" should be sectioning was performed on

p12781 lines 9-12 "The closed circles denote the outer diameter and the open circles the inner sphere diameter" Should be "the filled circles indicate the inner diameter and the unfilled circles the outer diameter."

p12782 lines 13-15 "The contrast differences of the coccoliths, which can be seen in image 5.2 (brighter area at the lower right side of the coccosphere) can be caused by

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orientation differences of the calcite platelets. do you mean differences in crystallographic orientation or in the the angle of the exposed face to the beam? Also it would be useful if you indicated with an arrow the area referred to.

p12784 lines 19-20 "It has been put forth that coccoliths act as ballast stones in the cell's buoyancy control (Winter and Siesser, 1994)" better "It has been suggested that coccoliths may have a ballasting function by increasing the cell's density." Also Winter & Siesser is an edited volume and the reference should be to a specific paper, or papers, within it.

p12785 "It is simply not possible to obtain the required information on architecture in the context of a standard culture experiment, because the number of analyses required is at least an order of magnitude bigger than the one performed in the present study. This is far too time-consuming to fit the scope of a standard culture experiment, which usually focuses on other parameters such as organic carbon production" This is not necessarily true since with light microscopy it is easy to measure both cell diameter and coccosphere diameter - see Gibbs et al. (2013 - in your bibliography) for an example of this.

p12785 "Taken together with individual cell PIC/POC ratios, this sheds new light on the old question of the relationship between coccolithophore nutrient limitation and sinking rates." Why don't you calculate the sinking rates? You can do this using Stokes Law (discussed in Young 1994 - in Winter & Siesser 1994 - where I also made predictions of density based on much less precise data).

Fig 3 The caption appears to be mislabelled - the filled blue dots are presumably the inner diameter and the open red dots the outer diameter. I do not understand what the text at top left of the diagram refers to The caption for fig 3b is confusing and needs to be rewritten

Fig. 4 Caption of y axis should be "coccosphere thickness"

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