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Interactive comment on "The role of ocean acidification in *Emiliania huxleyi* coccolith thinning in the Mediterranean Sea" *by* K. J. S. Meier et al.

Anonymous Referee #1

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The manuscript of Meier et al. is an interesting and highly timely piece of original research. The authors report a decrease in E. huxleyi coccolith weight in the years 1994-2006. The samples analysed come from a NW Mediterranean sediment trap. Additionally samples from surface sediment and sediment core samples are analysed. Essentially, data derived from the latter sample-set back up conclusions drawn from the sediment trap data. Briefly, the authors compare the decrease in coccolith weight with changes in several environmental parameters such as temperature. They analyse both seasonal variability and long-term trends. In the following I'll focus on the latter. Basically, their conclusion is that changes in seawater carbonate chemistry are likely responsible for the decline of coccolith weight. Since carbonate system data are only

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available for 1998-2000 and 2003-2005, the carbonate chemistry for the remaining periods was interpolated. It is not entirely clear how that was done, though (P 19707, L 19-26). I suggest explaining the "linear regression" in more detail. Given that changes in carbonate chemistry are indeed responsible for the coccolith weight decrease, two points deserve more attention than they get in the current version of the manuscript. Firstly, the slope of the weight decrease is unexpectedly steep. By this I mean the slope of the weight versus e.g. CO_2 curve. With increasing CO_2 coccolith weight decreases. The overall slope, i.e. linear regression using the highest and lowest weight, is by two orders of magnitude steeper than the slope reported in the experimental study by Bach et al. 2012. For the calculation I used data in Table 1, specifically the TA constant set from 288-1004 CO_2 (Bach et al. 2012). Why should the slope in the Mediterranean field data-set be so steep by comparison? This question deserves a paragraph of discussion. Secondly, the decrease in coccolith weight is clearly comprised of two slopes. A shallow one from 1996-2004, and a steep one from 2004-2006. The latter is by a factor of 5 steeper than the former. The alleged cause, i.e. CO_2, pH, or.... change, is linear with a single slope. How can that be explained? This question, too, deserves a paragraph of discussion. On a minor (and purely formal) note, I would say that the "Conclusions" section is in fact part of the "Discussion" section and should be incorporated in the latter.

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