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Interactive comment on "Calcification and distribution of extant coccolithophores across the Drake Passage during late austral summer 2016" *by* Mariem Saavedra-Pellitero et al.

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Referee #2 (R#2): The paper presents well documented distributional data of coccolithophores and in particular E. huxleyi morphotypes across the oceanographic fronts in the area of the Drake Passage, an important zone for monitoring the path of the Antarctic Circumpolar Current. The presentation of the methods and data is clear and the discussioni is well supported, showing a consistent latitudinal trend of decreasing coccolith mass along with temperature decrease and a gradient in carbonate chemistry parameters. Overall the manuscript represent a substantial contribution in the field of coccolithophore studies, adding new information and providing accurate mea-

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Discussion paper

surements of both Ehux types and coccolith mass. The data are well presented, with figures and plates are of excellent quality.

Mariem Saavedra-Pellitero et al. (MSP): We thank reviewer#2 for his/her positive feedback and insightful comments. We made modifications in the text based on his/her suggestions.

R#2: Some points deserve further discussion, in particular: section 4.3 is well organized and points to significant changes in the coccolith mass of E. huxleyi across the different fronts and zones of the ACC. However, while the degree of calcification is considered as the main driver of coccolith mass variation (but the assessment of degree of calcification and mass is done with different techniques, so there can be no direct attribution), there is no discussion about the influence of coccolith size on cocolith mass, e.g. type C is smaller than B/C which is smaller than type B, by definition. MSP: This was one of the main challenges of this study: to choose the best way to characterize the coccolithophore assemblage while minimizing the error in the coccolith mass estimates. For this reason we choose to combine SEM analyses and C-calcita LM measurements. Using just LM techniques would not have allowed us to distinguish the different E. huxleyi morphotypes (i.e., O type from B/C), and using only SEM techniques, would have implied to calculate the coccolith mass with the equations of Young and Ziveri (2000), being forced to assume some of the values (e.g., the shape-dependent constant Ks). That is the reason behind using different techniques for this research. Regarding the influence of coccolith size on cocolith mass, we are aware that (by definition) there is size variation (Table 1) and certain overlap in size among different E. huxleyi morphotypes, which makes a direct comparison complicated. That is why we provided (as a first approach) Figure 11, but we decided to stick just to the mass variations in the manuscript. Biometric work would be required for the discussion that reviewer#2 is asking here, but we think that it is a topic for future research.

R#2: Carbonate chemistry parameters. The discussion of the relation between coccolithophore calcification and the carbonate chemistry of the water column should be considered even more carefully, given the fact that the data are not measured in the same samples and the pattern of pH variation is not so clear – a different trend appears if the different calculations are considered, e.g. fig. 12. MSP: Yes, we agree with reviewer#2, but as pointed out by reviewer#1, we made it very clear throughout the manuscript that those are not in situ measurements. We believe that it has been well specified, and it is depicted even in the conclusions.

R#2: However, the correlation with omega calcite seems meaningful, looking at the graphs, but this parameter is not considered in the discussion. MSP: We added more discussion in the section 4.3 regarding the weak correlation between calcite saturation and coccolith mass.

R#2: The last sentence of the conclusion is however not supported and does not explain how climate change will affect the calcification mode of coccolithophores, given that no clear relationship between the degree of calcification and the carbonate chemistry of sea water are established yet, but rather different correlations seem to exist in different areas of the world oceans and under different oceanographic conditions, so the question remains open. MSP: This point has somehow been made also by reviewer #1 and it has already been addressed, highlighting the temperature as a controlling factor.

R#2: Page 11 line 12: also Malinverno et al., 2016 show the shift in dominance from coccolithophores to diatoms in water samples across the PF / sACCf, so this could be cited. MSP: We thank reviewer#2 for suggesting this paper. We included this reference and reworded the sentence as follows: "In any case the southernmost extent of coccolithophores is also influenced by the clear dominance of diatoms south of the PF, as suggested by the high diatom concentration (valves/g dry sediment) and biogenic opal content recorded in surface sediment samples from the AZ of the Drake Passage (Cárdenas et al., 2018) and from Pacific Southern Ocean extant plankton studies (e.g., Saavedra-Pellitero et al., 2014; Malinverno et al., 2016)."

R#2: Typos: Page 1, line 22: classified -> identified MSP: We changed it to “identified”.

R#2: Page 2, line 6: delete “substantial” which is repeated twice MSP: The extra “substantial” was deleted, as suggested also by reviewer#1.

R#2: Page 2, line 7: dissolved carbon Âż dissolved inorganic carbon MSP: We changed it to “dissolved inorganic carbon”.

R#2: Page2, line 16: phosphate is mis-spelled MSP: We corrected it.

R#2: Page 2, line 28: the future -> in the future MSP: We changed it.

R#2: Page 4,line 6: (2004) is repeated MSP: We deleted one of the “(2004)”.

R#2: Page 7 line 20: this taxa -> this taxon We changed it to “taxon”.

R#2: Page 8 line 1: later -> latter MSP: We corrected it.

R#2: Page 13 line 5: established -> established by MSP: We added “by”.

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