

Re: “Coccolithophore abundance and production and their impacts on particulate inorganic carbon cycling in the western North Pacific” by Yuye Han et al.

May 2, 2025

Dear Editor,

Thank you very much for your decision to accept our manuscript, “Coccolithophore abundance and production and their impacts on particulate inorganic carbon cycling in the western North Pacific”, for publication in *Biogeosciences*. We are sincerely grateful to you and the reviewers for your time and thoughtful feedback on our revised manuscript.

In response to the most recent comments, we have made further revisions to our manuscript. Below, we provide a detailed summary of the changes made.

Sincerely,

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Response to reviewers

Ln 22, it would be good to define small PIC (i.e. <51 μm) here in the abstract as it is not explained until later in the manuscript.

[Response]: We have now defined “small-size fraction (1–51 μm)” and “total PIC (> 1 μm)” in the abstract of the revised manuscript (see Lines 21–22).

Ln 234, species name should be *Discosphaera tubifera* rather than *Dicosphaera*.

[Response]: We have corrected this in the revised manuscript (see Line 234).

Ln 469, Consider rephrasing the line 'our results suggest that calibration of satellite-derived PIC should be unreliable'. Do the authors mean calibration (i.e. value to value comparison) or interpretation of patterns and dynamics of satellite-derived PIC? The thrust of the discussion is that more is happening at depth in terms of PIC production and species dynamics than is revealed in satellite-derived PIC (as it sees only the surface waters) rather than satellite PIC being a poor measure of in situ PIC.

[Response]: Following the suggestions from the Reviewer, we have rephrased the whole paragraph as follows:

Overall, our findings suggest that while satellite-derived PIC can reflect surface-layer distribution patterns, its calibration should be interpreted with caution, as it does not reliably capture total water column PIC production. We observed a significant positive relationship between surface coccolithophore calcite concentrations and satellite-derived PIC concentrations ($r^2 = 0.84$; $p < 0.01$; Fig. S5a), indicating that satellite data can reflect the spatial distribution trends of the surface calcite. However, this correlation does not extend to actual values, particularly in high latitude areas where satellite-derived PIC is likely overestimated. Across the full euphotic zone, no significant correlation was found between satellite-derived PIC and measured PIC production, which is also noted by Ziveri et al. (2023) for the CDisK-IV cruise (Fig. S5b). More in situ measurements, such as calcification rates determined from ^{14}C incubations and direct measurements of coccolithophore turnover time, are needed to reduce uncertainties in estimating PIC production and assessing the oceanic CaCO_3 budget. Please see Lines 469–477 of the revised manuscript.

Reference

Ziveri, P., Gray, W. R., Anglada-Ortiz, G., Manno, C., Grelaud, M., Incarbona, A., Rae, J. W. B., Subhas, A. V., Pallacks, S., and White, A.: Pelagic calcium carbonate production and shallow dissolution in the North Pacific Ocean, *Nat Commun*, 14, 805, <https://doi.org/10.1038/s41467-023-36177-w>, 2023.