

## Response to reviewer

Thank you for the opportunity to review the revised version of this paper. The authors have responded to the questions and feedback from the editor and reviewers and the paper is now much improved. The revised methods section is much easier to read and the removal of the fmodes is a helpful simplification. The fact that the fmodes did not show any significant relationships with key ecosystem functions may be interesting and worth investigating further, but I don't think it is ready for publication yet. The authors have adequately addressed the other points raised in review:

- The link between the higher HNA cell-specific rates and the assumptions built into the model parameters (lines 356-362 and the abstract);
- The reasons for, and the need to improve on, the low variability in the model outputs compared to observations (lines 382-386).

The paper has some novel aspects and its methods could be debated, but in my opinion it is now ready to be published and further discussion can happen through the normal scientific process.

[Thank you very much for your positive review.](#)

There are just a few very minor points which I think should be addressed, as follows:

Line 205: I suggest adding a reference to Text S3 as well as Tables S2-S6.

[Fixed.](#)

Line 232 “the model captured best the temporal and spatial (depth) variability of PP”: I don't understand why this is “best”. The skill for PP is relatively low, looking at Figure 3. Is the point that for PP the variability is captured better than the absolute value? I think this sentence needs revising.

[Revised \(line 232-233\).](#)

Line 259 “There was little interannual variability in the average microzooplankton”: the values in Figure 5 range from 0.39 to 0.76, which does not appear to me to be small variability – the highest value is nearly twice the lowest. This sentence needs to be rephrased, or the variability put into context to explain why this variability is little.

[Revised \(line 259-260\).](#)

Figure S9 legend: I think the units are not correct – if the values are normalized by NPP they should not be in mmol C m<sup>-3</sup> etc.

[You are correct as it should be unitless. We removed particle sinking flux values in Figure S9 as its unit becomes irrelevant and difficult to interpret if normalized by PP or PP in 1-day.](#)

Figure S10a: The number 5 is almost invisible on the yellow hexagon – could it be changed to black?

[Fixed as suggested.](#)

There are a few spelling mistakes in both the manuscript and the supplementary material. Use of English: I suggest the following changes for the authors' consideration. In my opinion they would improve the clarity of the manuscript.

[All of these spelling mistakes have been fixed following your suggestions below.](#)

Line 128 “the results from 10 m are only presented in detail”: I think this should be “only the results from 10 m are presented in detail”.

Line 130 “yet to include the adequate number”: change to “yet to include an adequate number”

Line 223: add “of” after “Because”

Line 256 “the variable for a single year’s”: I think this should be “the variable for which a single year’s”

Line 336 “we assigned the identical initial parameter value”: change to “we assigned an identical initial parameter value”

Line 347 “exhibited the intermediate levels”: remove “the”, i.e. “exhibited intermediate levels”

Line 348 “same number of the constrained parameters”: remove ‘the’

Line 350 “suggesting the connection”: change to “suggesting a connection”

Line 366 “with the cell-specific growth rate”: change to “with a cell-specific growth rate”

Line 374 “the strong interannual variability”: remove “the”

Line 390 “showing the increased HNA growth rates”: remove “the”

Line 406 “often observed during the Antarctic phytoplankton: remove “the”

Line 447 “was characterized by the negative temperature anomaly”: change “the” to “a”

Line 448 “and the positive sea-ice anomaly”: change “the” to “a”