

Interactive comment on “Dimensions of Marine Phytoplankton Diversity” by Stephanie Dutkiewicz et al.

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Here, Dutkiewicz and colleagues using a biological rich model embedded in a global circulation model to examine underlying controls on global pattern of plankton alpha-diversity. Overall, it is a really nice study. It is well written, the results are clearly presented, the results are very interesting and the paper generally include a very thoughtful discussion. As such, I only have minor comments.

I really appreciate that the authors are very explicit about these results being found in a ‘model’ world. This distinction is often blurred.

Figure 1 is very convincing.

The study would benefit from a formal comparison between observations and model

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outputs. Right now, we are left with a visual test. Most global ocean model studies suffer from this issue but I just don’t like statements like ‘similar pattern’ and such. These statements sometimes cover an awful match. I don’t this is the case here but nevertheless. . .

There is obviously a lot to learn from using an R* type framework. However, the framework (in general and as applied here) ignores a key ecosystem feature, whereby organisms switch between different variants of the same resource (e.g., ammonium, nitrite, nitrate, urea, other DON, etc.) – each likely less palatable. This possibility for resource substitution changes the dynamics of diversity in relation to nutrient levels. For instance, it is likely much harder to have competitive exclusion and specialization in one resource might come at the expense of others. This does not invalidate the current study in anyway and it would be challenging to model all these additional tracers. However, I think it would useful to discuss this limitation – especially as it relates to the emergent diversity patterns.

Do you have any issues with the smallest or largest size class? In other words, are there biological boundary problems due to less competition at the edges.

L449: I think it is a mistake to think of latitude as an environmental factor. Also, I think it is unfair to characterize past studies as simple statistical correlations. When people are looking for relationships to latitude, they are not arguing that plankton respond to where they are located on a map. Rather latitude is a placeholder for a range of abiotic and biotic interactions. Thus, I think it is reasonable to look at relationship with latitude and I found this section a tad too negative about past efforts.

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