Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-104-RC1, 2017

Geoscientific Model Development Discussions

Interactive comment on "CITRATE 1.0: Phytoplankton continuous trait-distribution model with one-dimensional physical transport applied to the Northwest Pacific" *by* Bingzhang Chen and S. Lan Smith

Anonymous Referee #1

Received and published: 10 July 2017

This paper describes a trait-based continuum plankton model, with size as the principle trait, and successfully uses a parameter optimisation routine to extract the trait characteristics (mean size and variance) at two contrasting study sites.

Major comments. ==========

1. The lack of a size-dependent feeding preference is the single biggest limit to this model. Ideally any plankton web will have a size-range (or a size-trait continuum) for both phytoplankton and zooplankton, as size is such a structuring component of

the plankton across a broad range of sizes and trophic level. Positively, by excluding size-ranges in grazing the model presented does allow a simpler exploration of characteristics of phytoplankton size structuring.

2. Eq. 7b is missing the detrital remineralisation term, possibly where the two minus signs are.

3. P15, last paragraph. The use of trait derivatives sounds important, but it was introduced too quickly for me. Could you give a little bit further explanation?

4. The first sentence is a turn-off.

5. Section 4.2.2. Transport of moments (instead of species) is the biggest issue of this type of trait-based approach. Or is it? This section quantifies through one example for a Gaussian distribution the size of the error. But the particular example chosen seems destined to show a small error, as one community is much smaller than the other. It would be better to show the example with the greatest possible error. Would that be a Gaussian with equal biomass but very different mean size?

Minor comments. ==========

P3, L2. Distinguishing between identity and diversity in the first sentence is confusing.

P3, L22. I think you mean in practice impossible, rather than almost impossible.

P4, L15 If trait number = N, trait resolution = D, then difference = N(D-2)-1. The derivative of the difference with trait resolution is N (independent of D). So it is not exponential, it is linear, with a slope N.

P6. L16 Do you mean Eq. (4a)?; bimodal?

P8. Z = depth. [water depth sounds like the bottom depth?]

P11, L8 "and both model" – sentence has gone astray?

P14, L10 "Large phytoplankton are susceptible to light limitation" I thought it was nutri-

ents?

Table 1. Unit of Kchl should be m-2 as written inside the -1 bracket.

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-104, 2017.