

## ***Interactive comment on “PhytoSFDM version 1.0.0: Phytoplankton Size and Functional Diversity Model” by Esteban Acevedo-Trejos et al.***

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Received and published: 5 September 2016

The use of trait-based modelling has been one of the main approaches to tackling complexity in pelagic ecosystems, and size is undoubtedly the most important trait. This software will provide users with the opportunity to quickly explore size in modelling pelagic ecosystems. Through the provision of means to control the trait changes through either Immigration and/or adaptation, the tool also provides a step towards applying this approach in more complicated settings. Thus this manuscript meets the goals of GMD.

The most significant weakness of the PhytoSFDM model appears to be the lack of consideration of the effect of phytoplankton size on light capture by phytoplankton. This is especially surprising since the effect of size on light capture is arguably better un-

C1

derstood than nutrient uptake and grazing due to the strongly geometric nature of the phenomena, and the Finkel paper they cite is a good starting place for this understanding. Should this angle be pursued, considering the vertical attenuation as a function of both phytoplankton biomass and the size-distribution could be easily undertaken (see Baird et al., 2007 for a simple to size-dependence, although more complicated version approaches to size are available).

But the impact of size on light capture is not the only trait that new users might explore. The authors invite readers to use their software. Many will want to add another process / complexity. It would be useful if Section 6 gave a few insights into how possible this is, and how a new user should go about it.

The manuscript is not overly long. I would recommend that the moment approach be given a brief summary, as this manuscript, if it produces interest, will likely be read by some scientists unfamiliar with the approach. By matching a brief summary with the specific equations and test case results in this paper may be quite useful.

Minor comments. L13 “World’s oceans” or perhaps “global ocean” L22 Mentioning the Levin triad, which I had not heard of, in the 2nd line of the Introduction is a bit obscure. L78 replace “mixing” with “exchange” L106  $H(l)$  isn’t quite the average light, because light above the saturation level appears to be discounted. L122 I think the Hansen studies are based on lab work (whereas to oceanography types observations imply in the ocean). L135 I would include the phytoplankton equation in the list to (1) make it complete (i.e. have  $N$ ,  $P$ ,  $Z$  and  $D$  altogether), and (2) because in its earlier form it is written as  $1/P \, dP/dt$ , so conservation of mass is not immediately obvious. L185 I wasn’t sure if the outcome of the trait diffusion parameter was greater if the growth rate was faster. Is that the outcome of the equation above? If so, sounds entirely reasonable and should be stated more explicitly.

Reference: Baird, M. E., P. G. Timko, L. Wu (2007) The effect of packaging of chlorophyll within phytoplankton and light scattering in a coupled physical-biological ocean

C2

model. *Marine and Freshwater Res.* 58, 966-981.

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Interactive comment on *Geosci. Model Dev. Discuss.*, doi:10.5194/gmd-2016-102, 2016.