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Discussions

Interactive comment on "*MEDUSA*: a new intermediate complexity plankton ecosystem model for the global domain" *by* A. Yool et al.

Anonymous Referee #1

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Synopsis

This manuscript describes MEDUSA, an ecological module representing two classes of phytoplankton (diatom and non-diatom), two classes of zooplankton (micro- and meso-zooplankton). Fast and slow sinking detritus pools are represented, as are nutrients in the form of dissolved inorganic nitrogen, "dissolved" iron and silicic acid. The ecological module is driven by a three-dimensional ocean circulation model (NEMO).

The authors have constructed a "minimalist" model which might be sufficiently detailed to resolve some key planktonic influences on the global carbon cycle. The ecological resolution and physiological representations resemble the models of Chai et al from several years ago, with some differences and refinements. The limitation of primary production by light, N or Fe is resolved and chlorophyll content is flexible. Phytoplank-

ton growth is described with Monod kinetics and Liebig's law. The export ratio is subject to the selection for diatoms or other organisms. The description of sinking particulate is explicitly reflects a role for ballasting.

Comments

The manuscript describes clearly a well thought out model of this particular class. In my view there are no significant new advances in terms of the fundamental model structure or the parameterizations employed. However, collectively, the particular configuration presented is up to date, carefully considered and appropriate for many biogeochemical/climate modeling applications.

As a detailed technical description of this set of model algorithms, the manuscript is generally clear and allows the reader to find the sort of detailed information which often goes unpublished. However, without any specific application, it is on the dry side and certainly for afficionados only.

Some specific points and questions:

1. Given that this is a technical description of the basic model algorithms I feel that some graphical depiction of the parameterizations used would be nice and helpful. For example, the relationship between growth and Si:N for diatoms would, I think, be very simple to absorb if also shown graphically but is rather stodgy in algorithmic form (though useful reference).

2. Some of the key choices come into the values of the parameters and could be discussed in more detail. For example, why are Vpn and Vpd (maximum growth rate for non-diatoms and diatoms) 0.53 and 0.50 d-1 respectively? Presumably this is some balancing of the apparent taxonomic adaptation for fast growth rates (for given size class) by diatoms, traded off against their larger average size? How significant is the difference? What if it were reversed? Given the lower maximum growth rate and Si demand, why do diatoms persist in the solutions? (Presumably lower grazing pressure.).

These somewhat subtle choices are very important but are not discussed.

3. The decision to relax DIN and silicic acid concentrations towards WOA values in the global simulations seems rather curious and I wonder if it has any significant impact on model solutions at this resolution? If so, what?

4. A measure of "skill" is presented in terms of the Taylor diagrams, but such evaluations are somewhat in a vacuum in the absence of a specific application: we dont have that context here. However, they might be useful for a future reference.

5. The relatively good correspondence of nutrient fields with WOA is rather unsurprising: the model was initialized with WOA fields, integrated for only 40 years, and relaxed towards WOA fields at the ocean margins.

Interactive comment on Geosci. Model Dev. Discuss., 3, 1939, 2010.