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Ocean Science Discussions



# *Interactive comment on* "Modelling approach to the assessment of biogenic fluxes at a selected Ross Sea site, Antarctica" *by* M. Vichi et al.

**Anonymous Referee #2**

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The manuscript "Modelling approach to the assessment of biogenic fluxes at a selected Ross Sea Site, Antarctica" by M. Vichi et al. is a nice contribution to the processes involved in the C cycle in the Southern Ocean, mainly those related to the carbon vertical transfer along the water coulmn. It addresses relevant scientific questions within the scope of Ocean Science, and should be published.

Overall, the manuscript is well presented and the methodology which was followed is well described. Tables and figures are clear and relevant. The title and abstract well match the discussion paper. The number and quality of references are appropriate.

The authors have used a coupled 1D biogeochemical-physical model to analyze the processes involved in the vertical flux of biogenic material in a selected site of the Ross Sea. The model was set up to reproduce the observed seasonal cycle of phytoplankton

and organic matter fluxes. Some original data from the Ross Sea are presented, and the use of a model to understand the observation variabilities is interesting. Another strenght is to allow the elemental ratios to vary in time and from one compartment to another. However, it complicates the choice of mineralization rates.

The bias induced by such methods between simulated and observed parameters are generally well addressed and discussed in the last part of the paper. However, i would like to outline some of the results and make some comments and suggestions, if not for this version of the manuscript, for a further study:

The temperature profile is well captured by the physical model implying that the hydrological features are reasonably reproduced and should not interfere much in the above-mentioned discrepancies, except for those linked to the horizontal transport of the biogeochemical parameters.

As mentioned by the authors, the surface seasonal silicate drawdown is underestimated in the model as compared to the observations, which lead to an underestimation of biogenic silica flux along the water column. As the Antarctic Ocean is generally poor in iron, the Si:N uptake by the diatoms should be increased in the model to match the observations. N seasonal variations is about 4 mmol/m3 vs Si of about 12 mmol/m3. As the diatoms support mesozooplankton grazing which in turn is the main contributor to the fast sinking biogenic material, such a correction may ameliorate the biogenic silica flux found at 550 m. I don't understand why the authors suggest that an increase in the ratio does not substantially improve the results ?

Any of the sensitivity analysis on vertical sinking velocity and mineralization rate has been able to reproduce the observed biogenic material peak in december. This means that the model should include a better planktonic succession during the spring / summer time period. It seems to me that Pondaven et al. (2000) in the Indian Ocean sector of the Antarctic have shown that diatom blooms occur in spring and is followed by other planktonic species. Again such a correction will improve the timing for the maximum



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organic carbon flux at 550 m. Is there any way to represent this process in the model without using an ice - biogeochemical model as suggested by the authors in the last section of the manuscript ?

I could not find any comment on the overestimation of organic N flux at 550 m ? A suggestion would be to increase the N mineralization rate in the water column.

As a matter of fact, organic N is mainly found in proteins which tend to be fastly mineralized as compared to, for example hydrocarbons.

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Interactive comment on Ocean Sci. Discuss., 6, 1477, 2009.