

Interactive comment on “Marine geochemical data assimilation in an efficient Earth System Model of global biogeochemical cycling” by A. Ridgwell et al.

A. Ridgwell et al.

Received and published: 8 December 2006

1) With regard to the “simple parameterization” of biological production and lack of a “somewhat more comprehensive marine biogeochemical cycle including other nutrients”: our model is admittedly just the first step in a long-term development of marine biogeochemical cycling. A very simple scheme seemed to be a good place to start because of the novel application of an optimization/calibration technique and also because there was already a considerable amount of model parameterizations (such as for aqueous carbonate chemistry and isotopic fractionation) to define and be described. We have now made a bit more of the limitations of the simple scheme and explicitly discuss current work-in-progress and planned future development of the marine biogeochemistry in the GENIE model as well as the sort of questions these developments will help

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

answer.

2+3) The high rates of intermediate water ventilation of CFCs and anthropogenic CO₂ at high latitudes is indeed a major draw-back of the 8-level version of the ocean GCM in GENIE-1. We may have given insufficient attention to this topic, which we now address by including additional discussion and a figure illustrating the locations and magnitude of anthropogenic CO₂ uptake and contrast to observations. We have also modified the conclusions following the recommendation of the Referee. As to whether the high rates of high latitude intermediate water ventilation are likely to give rise to a significant bias to the biological (PO₄) cycle; we think it unlikely. If the supply of PO₄ and alkalinity into the euphotic zone was significantly overestimated, then to achieve reasonable surface values, export would have to be similarly overestimated. However, the diagnosed export of POC lies towards the centre of the spread of current (high resolution) GCM estimates, while the estimated global export flux of CaCO₃ is near identical to the recent GCM data- assimilation study of Jin et al. [2006], itself one of the lowest values for CaCO₃ export flux proposed. We have extended the discussion of the intermediate water ventilation problem to this effect.

Interactive comment on Biogeosciences Discuss., 3, 1313, 2006.

BGD

3, S869–S870, 2006

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper