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Climate of the Past Discussions

Interactive comment on "Application of sediment core modelling to understanding climates of the past: An example from glacial-interglacial changes in Southern Oceansilica cycling" *by* A. Ridgwell

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I am grateful to Guy for his helpful & constructive suggestions, as well as for his support for the manuscript. I have addressed these as follows.

The description of the testing of different (and combined) hypotheses (Section 3) has been broken up and re-organized to address the recommendation for: "A slight re-organisation of Section 3 would be beneficial for the overall readability of the paper", that "Each one of the tested hypotheses deserves its own subsection", and "part of the discussion would better be moved into an additional new section". The latter comment addressed by means of the creation of a new 'Discussion' section (#4).

Guy lists a number of specific comments, which I have addressed as follows:

To address the “It would be interesting to get a few additional details about the sediment model included, which is obviously central to the paper. It would in particular be interesting to know more details about the “[. . .] diffusive-like transfer [. . .]” between the deeper sublayers (page 1374, lines 2-11), e.g., the biodiffusion coefficient adopted, the depth to which bioturbation is allowed to extend, etc” I have substantially expanded the description of the model, particularly the sediment component as well as adding 2 new figures to illustrate the set-up, including plotting the biodiffusion profile.

Added a new panel showing the model-data comparison for core V22-108 in Figures 3, 4, and 5, to address the request for more details about the result previously only briefly mentioned in the text: “[. . .] the prominent 10-20 wt% opal highs; [. . .] in cores lying 5-10° further to the north (Mortlock et al., 1991)”.

Added a new Figure (#5) of the effect of both mechanisms combined, to facilitate comparison with the effect of the (dust and sea-ice) mechanisms in isolation and address the suggestion: “if the combined effect gives a “[. . .] better simile of the opal data particularly south of the APF [. . .] than sea-ice alone,” and if “This beneficial interaction is not obvious from the effects of the two mechanisms in isolation” – and I agree that this is not obvious - then there is no reason for not showing that result”.

Added a comparison between model-predicted and observed atmospheric CO2, in line with the recommendation that: “I would furthermore be glad to see the generated atmospheric CO2 histories, which could easily be plotted on a fourth panel on each graph”.

Expanded the conclusions section and make less general.

Corrected typos.

Interactive comment on Clim. Past Discuss., 2, 1371, 2006.