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Climate of the Past Discussions

Interactive comment on "A regional ocean circulation model for the mid-Cretaceous North Atlantic Basin: implications for black shale formation" *by* R. P. M. Topper et al.

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Referee (W. W. Hay) comments on: R. P. M. Topper, J. Trabucho Alexandre, E. Tuenter, and P. Th. Meijer - A regional ocean circulation model for the mid-Cretaceous North Atlantic Basin: implications for black shale formation

General comment:

The term 'sponge' is used to designate some sort of special characteristic of the model at the gateways, but it is never described. As far as I know, computational 'sponges' were originally developed to act as absorbent baffles along coastlines or regional models to prevent the reflection of waves back into the main computational domain. I tried

to find some description of how 'sponges' might be used with reference to conditions in gateways, but was unable to do so. Since the gateways involve at least two-way flow I cannot figure out how the 'sponges' work. If this computational device has gotten very far from the original 'absorbent gridcell' concept it might be useful to give it a new name. In any case it needs to be described: what is it? How does it work? The authors should be aware that their audience is geologists who do not have extensive background in numerical modeling, much less in the peculiarities ofregional maodels driven by global models. I was unable to find any definition of 'sponge' in any dictionary or technical glossary (ie. Glossary of Geology) that would be helpful.

Also the term 'tracers'is used, I assume, in the old physcial oceanographic sense of teperature and salinity. Most geologists will associate tracers with chemical properties such and O2 content, PO4 content, etc., as discussed in Broecker and Peng's book Tracers in the Sea. It would avoid confusion to simply refer to salinity and temperature by those terms.

Other than for these terms which will confuse the larger audience, the paper is well written, and the conclusions significant and well justified. I was especially impressed with the estimated current flws within the North Atlantic Basin, which are strikingly similar to those of today (although in the north part of the basin opposite to those of today).

Some of the illustrations are so small that features such as the current arrows are difficult to read.

Editorial suggestions:

p. 2373, line 8, for 'then'read 'than' p. 2374, line 25, for 'in' read 'at' p. 2375, line 6, Poulsen et al. 2003 should be added to the references cited p. 2376, line 18 can you cite a reference for description of MOMA? p. 2378, lots of mention of sponges with no desciption/discussion of what they are, what they do p. 2379, line 18, 19 the rho in the equation is not mentioned in the text. I assume it is the density of seawater, but

many geologists reading the paper would not know that p. 2380 in the discussion of water fluxes, the P - E values are such that they would produce topography on the sea surface. Does the model use a ‘rigid lid’ or does it include the topographic effects? p. 2381 Section 2.1 is unintelligible without somewhere having a descrition of what the sponges are and what they do p. 2386, lines 10-12. The sentence is too complex. I suggest to delete ‘that starts’; replace ‘applied will’ with ‘were run to’ and add ‘the idea’ after ‘refute’ p. 2388, line 15. For ‘up’ read ‘down’ p. 2390, line 14 for ‘levelling’ read ‘reducing’ p. 2396, line 9 delete ‘diluting’ p. 2397, line 23 fro ‘only locally deposited’ read ‘deposited only locally’

p. 2390, line 20, delete ‘on’ at end of line

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