Clim. Past Discuss., 8, C863–C865, 2012
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Climate of the Past Discussions

Interactive comment on ""OAE 3" – a low- to mid-latitude Atlantic oceanic event during the Coniacian-Santonian" *by* M. Wagreich

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Received and published: 19 July 2012

Referee #1: #1: The author introduces a new term (Atlantic anoxic event, AAE). I do not think that the community needs again a new acronym. - Skipped the term AAE as I agree with the referees, Title also changed accordingly.

#1:...OAE3 ... mechanisms that are suggested to explain OAE3 in former studies should be mentioned in much more detail. - Added detailed discussion and refs.

#1: The last two paragraphs of section 2.1 contain a lot of interpretation that should be included in the discussion section. - Moved and discussed in detail.

#1: The author speculates that the Hitchwood event as defined by Jarvis et al 2006 might qualify as a potential candidate for an Late Turonian OAE3. This is highly spec-

ulative and therefore should be deleted. There is no clear evidence, that this isotope event is related to widespread deposition of organic-rich sediments at all. - This was rather a misunderstanding. Rewrote that paragraph, no OAE 3 relation intended.

#1:The last paragraph on page 1218 is in large parts a repetition of the introduction. - Rewritten and shortened, deleted repetitions.

#1:The end of the discussion chapter, that deals with models explaining OAE3 is very focused on the studies done on the African margin. Furthermore, it only explains how the cycles in these shales are formed, not the formation of black shales itself. Here, I think, the author has to be much more specific and should also include alternative models published for other regions of the North Atlantic like Demerara Rise (which is time equivalent to the African black shale sequence) or the South American basins (e.g., Venezuela or Columbia). - The paper now includes also discussions on Demerara Rise models (e.g. Hofmann & Wagner, 2011) and specific points and also more on Western Interior (Locklair et al., 2011).

#1: Some more technical comments and suggestions. - All corrected, references added and corrected, rephrased sentences.

Referee #2: ...However, the ms. is largely a "repetition" of Wagreich (2009). Also for this reason, I would expect the author to include a more detailed discussion of the paleoclimatic and paleocenographic scenarios accompanying the supposed OAE3 event(s) and how these relate to mid-Cretaceous globally distributed OAEs. - Although much more stratigraphic data is added I agree that a more detailed discussion of models/scenarios is needed. Therefore, the discussion chapter is now completely reorganized and includes a more detailed discussion on Atlantic paleogeography and proposed models/scenarios approbiate for OAE 3. This also relates to the second point of Referee #2: Why does the Atlantic remain prone to organic-carbon burial much longer than other basins? I interprete that as a matter of evolving deep-water circulation which was able to go through and form well-oxygenated bottom waters only from

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the early Campanian onwards in accordance with Friedrich & Erbacher (2006).

#2: Are the 0.5 ‰ positive excursions confined to the Atlantic? If yes, this suggests that the Atlantic was (largely) isolated from other basins. If not (you do seem to have similar geochemical profiles at Contessa), is 13C-depleted carbon burial alone sufficient to explain the 0.5 ‰ positive d13C excursions observed given the very restricted geographic and bathymetric setting where burial occurred? Comparison of the amplitude of carbon isotope excursion suggests burial of a mass of organic matter across OAE3 events equivalent to 1/4th – 1/6th of the carbon burial across globally distributed 'mid' Cretaceous OAEs (i.e. 0.5 ‰ vs. 2-3 ‰Ṫhis discussion would help in discriminating causes and effects in the process(es) leading to the observed sedimentary and geochemical anomalies. In particular, Above points should be addressed (maybe just a matter of putting them down in a few lines of discussion given the data available) before suggesting that the deposition of black-shales across OAE3 is not a consequence of a global climate event (pages 1218-19). - I added some lines about carb on isotopes based on the models of Locklair et al. (2011). My interpretation is that OAE 3 is not a global event of the same magnitude as, e.g., OAE 2. However, global climate evolution surely plays a role also during Coniacian-Santonian.

#2: 2) Hypothesizing a late Turonian OAE3 would need more data than the carbon isotope record and it also sounds a little bit at odd with the general discussion. - Rephrased that part, no Turonian OAE 3 was intended, just a comparison of magnitudes of carbon isotope excursions.

#2: 3) I would avoid introducing the term "Atlantic Anoxic Event". The large literature on Mediterranean sapropels seems to stand pretty well in spite of the lack of a term like "Mediterranean Anoxic Event". - AAE is deleted for these reasons.

#2: Technical comments - All corrected and revised.

Interactive comment on Clim. Past Discuss., 8, 1209, 2012.