Biogeosciences Discuss., 8, C4042–C4044, 2011
www.biogeosciences-discuss.net/8/C4042/2011/


**Biogeosciences Discussions**

# *Interactive comment on* "Latitudinal differences in the amplitude of the OAE-2 carbon isotopic excursion: $pCO_2$ and paleoproductivity" *by* E. C. van Bentum et al.

**E. C. van Bentum et al.**

bentum@geo.uu.nl

Received and published: 31 October 2011

Reaction to C2651–C2653 P. A. Meyers

*P. A. Meyers (Referee):" Although the authors mention something at least twice about "increased continental weathering, they do not directly explore the possible significance to weathering of the higher $pCO_2$ levels and particularly the amplified hydrological cycle that likely existed in the mid-Cretaceous. One likely by-product of greater weathering would be greater delivery of trace metals like Os and Zn to the oceans. Another consequence would be greater delivery of continental runoff to the coastal ocean, which would dilute the surface ocean and augment the impact of warmer global temperatures*



*on its stratification. Both of these factors would be especially important in the relatively narrow proto-Atlantic of the mid-Cretaceous. This narrow ocean would behave differently than the one we know now."*

Enhanced continental weathering would indeed result in an extra flux of Os and Zn to the ocean. The higher Os fluxes observed during OAE-2, however, coincide with low Os isotope values (Turgeon and Creaser, 2008). This suggests that the two Os pulses were more likely related to volcanic activity rather than enhanced weathering. This is now explained in the text (see our reaction to C2283–C2285 anonymous referee 1).

*P. A. Meyers (Referee):" A portion of the apparently greater discrimination against $^{13}C$ observed in the $\delta^{13}C$ records may derive from greater stratification and more recycling of isotopically light marine organic matter in the surface ocean, and the extent of this stratification could well be different at different latitudes."*

We agree that this indeed could potentially play a role in explaining part of the amplitude in $\delta^{13}$C org. By analyzing the $\delta^{13}$C values of isorenieratane, it is possible to estimate the fraction of incorporated $CO_2$ that is derived from organic matter respiration (van Breugel et al., 2005). Our, as yet unpublished data, showed that the relative contribution of recycled carbon to production is less than 20 % and we therefore feel that it may play a role but not an important one. To add this calculation to the manuscript would substantially lengthen the discussion and would be beyond the scope of the present manuscript. We intend to publish this data at a later stage.

*P. A. Meyers (Referee):" The authors also fail to mention the important high-resolution bulk organic carbon excursions at sites 1258, 1260, and 1261 shown in (Erbacher et al., 2005) in which the duration of the OAE2 was estimated to be 400 kyr."*

We are well aware of the fact that there is a long-standing discussion about the duration of OAE-2 in the existing literature; the time frame used in this paper is based on Voigt et al. (2008), who estimated the duration of the OAE-2 as 430–445 kyr. However, we will add the Erbacher reference at page 6196 line 6. For the discussion of our results

the difference between 400 kyr and 430 kyr is not essential.

*P. A. Meyers (Referee):" The discussion presented in this paper (Erbacher et al., 2005) includes isotopic information from other CTBE locations that could help to broaden and might bolster the interpretations and conclusions of van Bentum and colleagues."*

We agree that the Erbacher (2005) paper presents a very interesting discussion about isotope information about other OAE-2 sites, however, no compound-specific phytane $\delta^{13}$C measurements were done at these sites, and it would therefore be difficult to use them as a comparison in this study.

All linguistic suggestions made by this referee will be incorporated in the text.

References:

Erbacher, J., Friedrich, O., Wilson, P. A., Birch, H., and Mutterlose, J.: Stable organic carbon isotope stratigraphy across Oceanic Anoxic Event 2 of Demerara Rise, western tropical Atlantic., Geochemistry Geophysics Geosystems, 6, Q06010, doi:10.1029/2004GC000850, 2005.

Turgeon, S. C., and Creaser, R. A.: Cretaceous oceanic anoxic event 2 triggered by a massive magmatic episode, Nature, 454, 323-326, 2008.

van Breugel, Y., Schouten, S., Paetzel, M., Ossebaar, J., and Sinninghe Damsté, J. S.: Reconstruction of d13C of chemocline $CO_2$ (aq) in past oceans and lakes using the delta d13C of fossil isorenieratene, Earth and Planetary Science Letters, 235, 421-434, 2005.

Voigt, S., Erbacher, J., Mutterlose, J., Weiss, W., Westerhold, T., Wiese, F., Wilmsen, M., and Wonik, T.: The Cenomanian–Turonian of the Wunstorf section– (north Germany): Global stratigraphic reference section and new orbital time scale for oceanic anoxic event 2, Newsl. Stratigr, 43, 65-89, 10.1127/0078-0421/2008/0043-0065, 2008.

---

Interactive comment on Biogeosciences Discuss., 8, 6191, 2011.