

Interactive comment on “Imbalanced nutrients as triggers for black shale formation in a shallow shelf setting during the OAE 2 (Wunstorf, Germany)” by M. Blumenberg and F. Wiese

Anonymous Referee #1

Received and published: 17 July 2012

The manuscript by Blumenberg and Wiese reports new organic geochemical and bulk $\delta^{15}\text{N}$ data across the Cenomanian-Turonian Anoxic Event (OAE-2), and uses them to infer the trajectory and causes of change in marine ecosystem in this crucial interval of Earth history. Cause of anoxic events and formation of black shales are an old and new problem – the conventional views have regarded black shales and intercalating organic-poor sediments as representing ‘eutrophic’ and ‘oligotrophic’ conditions, respectively. However, much new organic geochemical data generated in the past decade have revised the conventional debates. This study also investigates changes in marine ecosystem based on new organic geochemical data which would extend our knowledge about what happened during the OAE-2. The conclusions in this manuscript,

C2513

linking the environmental changes, particularly the changes in marine ecosystem association with climatic condition and associated change in seawater nutrient condition, would add new details and a welcome increase of geographic coverage by reporting from shallow shelf area. The topic is interdisciplinary and the paper would appeal to different segments of the journal’s readership, geochemists, paleontologists, and people interested in Earth systems science of environmental changes in deep time at critical episodes. Although I find the topic well-suited for this journal, I have some comments and raise some issues that should be addressed for revising the manuscript.

Comments I am confused how the authors interpret the controversy of 2-methyl hopane indices between anhydro-BHTs (Figure 8a) and those calculated from hydrocarbons (Figure 9) which show opposite trends against $\delta^{15}\text{N}$. Although the authors mentioned briefly that ‘using anhydro-BHTs, lower 2-methyl hopanoid indices of 5 and 15% were generally calculated, and maxima correlated positively with the TOC contents. This is contrary to 2-methyl hopane indices calculated from hydrocarbons’ (p. 5382), no clear explanation can be seen in discussion. Given that the authors suggest cyanobacteria as the major contributors of 2-methylated functionalized hopanoids (p. 5385, lines 13–14), careful explanation is needed to justify the discussion about N_2 -fixation.

I think that the manuscript needs careful correlation of their data with the lithological, bio/chemostratigraphical, and organic geochemical data from deep-sea sites (e.g., North Atlantic) to clarify and strengthen the model shown in Figure 11. How the organic geochemical data from the Wunstorf core are correlated to the data such as TOC, 2-methyl hopanoids and isorenieratene provided by previous studies (e.g., Kuypers et al., 2002 Paleooceanography, Kuypers et al., 2004 Geology). Are they well supportive to Figure 11?

The manuscript needs more careful explanation to convince readers that the negative bulk- $\delta^{15}\text{N}$ records suggest ^{15}N -depleted biomass associated with the N_2 -fixation. I think that the authors need to justify that the bulk- $\delta^{15}\text{N}$ represents that of the source organisms.

C2514

Is there any difference in biomarker or N-isotopic compositions between black shales deposited during and after the OAE-2? Explain whether the post-OAE2 black shales are distinctive or identical to the OAE-2 black shales.

In Figure 11, what do APB, MCB, and LSB stand for?

Interactive comment on Biogeosciences Discuss., 9, 5373, 2012.