

Responses to Reviewer #2's comments

General comments:

This paper looks at the organic geochemistry of the black shales deposited in the run-up to OAE 2 at Demerara Rise in the equatorial proto-Atlantic. Using a range of biomarkers, the authors plot the increase in deoxygenation that moved in concert with increasing temperature, as documented by TEX₈₆ data. Although association does not prove cause and effect, the palaeoceanographic model they suggest makes general sense and they are careful to look also at the palaeotectonic context of their section in the light of the evolving South Atlantic, which could have impacted basin geometry and watermass stratification. An interesting highlight of the paper is the switch away from lycopane that is present in the upper Cenomanian to isorenieratane over the OAE 2 interval itself (Cenomanian–Turonian boundary), suggesting a change in the bacterioplankton consortium as photic-zone euxinic conditions took hold: presumably due to invasion by green sulfur bacteria.

AC- The authors are thankful to the reviewer #2 for taking time to provide constructive comments for this manuscript. All the comments have been taken into consideration in the revised manuscript.

Specific comments:

Given the sampling density of this core, and the fact that the sedimentary material can move around, I wondered whether the samples giving new data could be accurately fixed in the stratigraphy and combined with pre-existing data. Do the authors have any feeling for this?

AC- The authors acknowledge the dynamic of the sedimentary material presented in this manuscript. Although there could be slight shifts in the absolute depth of the two datasets relative to each other, we are confident that the data used in the manuscript are in the correct stratigraphic order based on discussions with authors of previous studies and isotopic comparisons.

My main grouse in the account is the mixing between rock (or sediment) and time and between rock and process. You cannot sample an OAE or pass up into it: it is a phenomenon that leaves a distinctive record. You cannot have a TOC value for OAE 2! Use of the term 'interval', which can be applied to both sediment and time, can be helpful.

Geological narrative should not be in the present tense.

In-text references should be preferably ordered consistently by date

AC- That is a wise observation. We acknowledge that we have conflated the OAE interval with the sediments at this site, and that is incorrect. In the revised manuscript, we have followed the advice to use the term 'OAE 2 interval'. We have also revised the tenses and references as based on the comments.

Details:

Line 23: I would hyphenate 'water column' where used as a compound noun–noun adjective.

Done

Line 27 and elsewhere: although the journal allows alphabetical in-text citations, I think that ordering by date is much to be preferred, as this technique indicates the academic trajectory of the point in question and gives credit where it is due. Referencing is date ordered in some places in the manuscript . . . but see below (Line 31 and 34). Make consistent throughout the manuscript.

Done

Line 31: references are not ordered by either alphabet or date!

Done

Line 34: references are not ordered by either alphabet or date!

Done

Line 41: Avoid beginning a sentence with an unqualified 'This' or 'These', which is often ambiguous. I suggest 'These phenomena'

Done

Line 76: I assume 'sediment' should be 'samples'? And change 'was' to 'were'

Done

Line 77: better would be "Cenomanian to Turonian interval"

Done

Line 79: here you are mixing rock and time. Unit IV is stratigraphically underlain by Albian phosphatic calcareous claystone

Done

Line 83: there is confusion here between a phenomenon (such as an OAE) and sediment. You cannot sample an OAE, only its sedimentary record. Rephrase with something like 'over the OAE 2 interval'. ('Interval' can be used for both rock and time and is a very useful term in this regard). I suggest changing 'following' (time word) to post-dating.

Done

Line 84: you cannot identify OAE 2 at Site 1258 (it is long gone!) Change to 'OAE 2 interval'

Done

Line 101? We know that sediments can move position in a core, so conflating data sets from samples taken years apart can be dangerous if correct stratigraphic order is not retained. How confident are the authors that all data are in correct stratigraphic order?

AC- The authors confirm the correct stratigraphic order for all the samples involved using the repository samples identification from MARUM, where the cores were kept. Then, the authors acquired the samples list from Erbacher for the published data and confirmed that samples used were within the interval and isotopically ($\delta^{13}\text{C}$)

superimposed to new data (GDGT samples-SST proxy) presented in this study. The average spacing for isotopes samples and GDGT samples are 0.12 m and 0.74 m, respectively. This indicates at least 6 samples corresponding data points in 0.12m dataset. Moreover, these two datasets indicate a very strong linear correlation between these two datasets ($r^2=0.9958$). Hence, the stratigraphic order is robust.

Line 117: better would be ‘...serves as a proxy for water-column anoxia. . . .’

Done

Line 142: ‘during’ is a time word and you are describing a geochemical characteristic of a sediment sample. ‘. . . in the OAE 2 interval . . .’ would be better

Done

Line 158” change to ‘water-column’ (with a hyphen)

Done

Line 162: change to ‘up to the OAE 2 interval’

Done

Line 166: change to ‘lower Cenomanian’: this is rock not time.

Done

Line 167: water-column

Done

Line 177: replace ‘ “Following OAE 2’ by ‘stratigraphically higher than the OAE 2 interval’ or similar.

Done

Line 178: change to ‘Upper Cretaceous’ – you are describing a feature of the sediment

Done

Line 182: delete hyphen after ‘long-‘

Done

Line 183” better would be: ‘culminating in the OAE 2 interval

Done

Line 190: hyphenate ‘bottom water’ used as a compound adjective

Done

Line 191: better would be ‘ just below the onset level of OAE 2’ (to avoid mixing sediment with a phenomenon)

Done

Line 194: replace ‘sometime’ with ‘in some cases’

Done

Line 205” ‘over the OAE 2 interval’

Done

Line 203: but presumably impinging on the sea floor if benthic foraminifera are affected?

Done

Line 205: change to ‘This phenomenon has also been reported. . . .’

Done

Line 211: change to ‘highest in the OAE 2 interval . . .’

Done

Line 211: change to ‘were driven’ – this is geological narrative

Done

Line 213” ‘were replaced’

Done

Line 218: ‘over the OAE 2 interval’ would be better

Done

Line 219: water-column

Done

Line 224: change ‘into’ to ‘during’

Done

Line 225: water-column

Done

Line 226: This process also gives rise. . . .

Done

Line 230/231: change to : ‘water-column’

Done

Line 234: change to: ‘these metal-isotope data by confirming . . .’

Done

Line 234: water-column

Done

Line 235: change ‘adding’ to ‘adds’

Done

Line 235 Line 225: water-column

Done

Line 240: delete hyphen from adverb to give ‘nearly closed’ – this is journal house style
Done

Line 244: change to ‘This result. . . .’
Done

Line 245: change ‘of’ to ‘for’
Done

Line 347: Line 225: water-column
Done

Line 253: ‘Therefore, this result illustrates the occurrence of marine water-column anoxia.’
Done

Line 256: change to ‘propagated’. . .’
Done

Line 257: should this be ‘bottom-water anoxia’?
Done

Line 257: change to ‘was linked’
Done

Line 258: change to ‘was overridden’
Done

Line 259: ‘watermass’ (one word)
Done

Line 260: change to ‘in contrast to. . . .’
Done

Line 264: should this be ‘deep-water convection’?
Done

Line 266: water-column
Done

Line 271: change to ‘during the Cenomanian. . . .’
Done

Line 273: change to ‘during this time’ (not necessary to repeat ‘Cenomanian’)
Done

Line 284: change to ‘that persisted. . . .’
Done

Line 287: change ‘is not’ to ‘was not’

Done

Line 289: change to ‘was related’

Done

Line 292: water-column

Done

Line 295: not clear what ‘these’ refers to – clarify

Done

Line 298: water-column

Done

Line 298/299: anoxia correlates with warming but association does not prove cause and effect

Done

Line 300: water-column

Done

Line 305: better would be ‘albeit modulated by climatic factors

Done

579/580” Cross-plot and water-column (add hyhens)

Done

AC- All technical comments (Line 23 to 580) are corrected in the revised manuscript.