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Interactive comment on "Cenomanian to Coniacian Water-mass Evolution in the Cretaceous Western Interior Seaway of North America and Equatorial Atlantic" *by* James S. Eldrett et al.

Anonymous Referee #1

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The study by Eldrett and colleagues tries to understand and constrain the nature and timing of water-mass evolution in the southern gateway to the Cretaceous Western Interior Seaway (KWIS) and define the associated paleoenvironmental and paleoclimatic processes. This article presents detailed palynological and geochemical analyses from Cenomanian-Conacian interval from southwest Texas,USA. They also analysed materials from the central KWIS, to the south in the Tropical Atlantic and Southern Ocean in order to do correlations and reconstruct N-S water mass circulation. This work proposes another model of ocean circulation in the KWIS to explain the presence of normal oxygenation conditions during CIE (OAE-2) in this zone. It shows, inter alia, a link between sea level variations and N-S oceanic circulation reorganization. Finally, authors

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discuss and try to explain the global trace metal drawdown during OAE-2 This is an interesting article with many new data. It provides opportunities to discuss the impact of N-S water mass exchanges on regional paleoenvironmental changes during a period with a predominant latitudinal water mass circulation. However, many portions/sections should be clarified or developed (- discussion about trace-metal significance (detrital versus authigenic origin); - discussion about sequential stratigraphy; - discussion about tethyan water mass in the western part of the Central Atlantic ocean. . .) and some paragraphs must be organised differently in order to help the reader (result and interpretation presentation with the same stratigraphic subdivision that is chronostratigraphic subdivision).

âĂć p.4 ligne 36 : change “paleonenvironmental” by paleoenvironmental

âĂć p.5 ligne 25 : “previously published organic and inorganic geochemical analyses” put bibliographic references

âĂć 2. Material and Method

In the supplementary data there is a lack of discussion on the authigenic origin of the trace metals used. To validate their types of source, the major and trace element abundances have to cross-correlated with Al abundances (indicators of detrital influx). See for example Lebedel et al., 2013 (Pal, Pal., Pal.)

You can also distinguish between redox proxies, Mo, V, U (Calvert and Pedersen, 1993) and palaeoproductivity proxies, Zn, Ni (Hatch and Leventhal, 1992).

Finally, there is no Measurement accuracy.

âĂć 3.1 Organic carbon-isotope Stratigraphy

In this section I think it is important to confront geochemical correlations with biostratigraphic correlations. This section seems to suggest that the identification of the Middle Cenomanian event and the Cenomanian-Turonian CIE is not based on age, but only on the magnitude of δ13 Corg positive excursion.

âĂć 3.2 Geochemistry p.6

It is necessary to re-organize this section. Use chronostratigraphic subdivision instead of lithostratigraphic subdivision. It lacks a description of the diverse sedimentary series that is the description of the main facies because the paleoenvironmental perturbations are recorded in the litho and biofacies. Are there cherts in these series?

âĂć 3.3 Palynology p.7

In order to help the reader, it‘s better to present the meaning of the different parameters studied and presented in figures 4-10 (for example T/M ratio, Dinocyst P/G ratio, Shannon-Wiener diversity and Simpson Hunter Diversity). This information should not only appear in the supplementary data.

âĂć 4.1 Âń Principal Component Analyses Âż (p. 8), Use chronostratigraphic subdivision instead of lithostratigraphic subdivision (same subdivision as geochemistry section).

âĂć p.8 line 19 “Gallium (Ga)-Al2O3 [kaolinite]” I don’t understand the direct link between Al2O3 and Kaolinite. Illite also contains Al2O3

âĂć p. 8 line 27 Âń redox sensitive trace metal concentrations Âż. Zn and Ni are also paleoproductivity proxies

âĂć p.8 line 35 change “paleonenvironmental” by paleoenvironmental

âĂć p. 9 lines 19- 23 “In addition, it is interesting to note that although phytoclasts plot negatively along eigen axis 2 and may represent a reduced masking effect of AOM during oxygenated conditions (Tyson, 1995); they also plot positively along Eigen score 1 (noncarbonate/ volcaniclastic trend) alongside freshwater algae and Areoligeracean dinocysts suggestive of a more nearshore environment (Brinkhuis and Zachariasse 1988; Harker et al. 1990; Li and Habib 1996)”. This last interpretation must be confirmed by the calculation of a correlation coefficient which, in my opinion, will not show a correlation. Here, you do only a suggestion but not a real interpretation because the

position of the phytoclasts is not at all correlated to the axis 1

âĂć p. 9 line 25 change “Figures 4-11” by Figures 4-6, 8-10

âĂć p.9 “Paleoenvironment Interpretation”

Use the same chronostratigraphic subdivision as geochemistry section (3.2).

If the sequence stratigraphy interpretation was not published before it’s important to explain it.

âĂć p.11, line 16-19 “The sporomorph assemblages during OAE-2 mainly record a relative increase in gymnosperms, in particular during the PCE interval, and thus any increase in T:M ratio may reflect transition from mega-thermal to meso-thermal vegetation (perhaps also reflecting increased pollen production by wind dispersed gymnosperms) in response to climate cooling episode rather than increased hydrologic cycle”. Ti/Al can be used as a proxy for eolian versus fluvial input. What does this proxy show?

âĂć P.11 “Regional water-mass evolution”

“In this study we infer three main water-mass properties: i) a restricted suboxic-anoxic marine water-mass characterized by low diversity dinocyst assemblages interpreted to represent a tethyan source; ii) an unrestricted/open marine oxygenated water-mass characterized by high diversity dinocyst assemblages interpreted to represent a boreal source and iii) a partially restricted dysoxic water-mass interpreted to represent a more local central KWIS source.”

It’s too direct, you have to explain!! Why do you talk about a tethyan source and no an Atlantic-tethyan source? You specify Âń a restricted suboxic-anoxic marine water-mass of tethyan source” before and after CIE. However Tethyan marine waters are generally well-oxygenated during these time intervals which are not the case of the Atlantic marine waters (see ref Monteiro et al., 2012 Paleoceanography for example. . .) ". It would be better to write water mass of Atlantic-Tethyan source.

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Section organization: use the same chronostratigraphic subdivision than previously.

âĂć p. 12 lines 8-12 “Lower Cenomanian sediments from the Equatorial Atlantic (ODP Site 1260) are interpreted as being deposited in a stratified suboxic-anoxic marine environment as indicated by laminated organic rich mudrock deposition and positive PCA-2 scores. This interpretation is consistent with a southern tethyan water-mass and a circulation controlled nutrient trap fuelling surface water productivity and anoxic depositional environment (Jiménez Berrocoso et al. 2010; Trabucho-Alexandre, 2010)”.

I don’t understand why it’s consistent with a southern tethyan water-mass. According Trabucho-Alexandre et al., 2010, this zone is the seat of upwelling of deep waters coming from the Pacific, no southern tethyan water-mass is mentioned by these authors.

âĂć p.12 line 17 : “with mixed dinocyst assemblages”. List of the genera

âĂć p.12, line 28 “In the Portland-1 core there is a clear shift from agglutinated to calcareous benthic foraminifera near the top of the MCE interval suggestive of a tethyan influence”

why? Is there no agglutinated and calcareous benthic foraminifer in shallow water environment in the Atlantic and Pacific oceans?

âĂć p.13, lines 35-39. “Furthermore, at ODP Site 1261, the recorded shift towards a more diverse and open-marine dinocyst assemblage is also associated with an increase in the abundance of organic foraminiferal test linings; re-population by calcareous benthic foraminifera (Friedrich et al., 2011), which combined with a reduction in redox sensitive trace metals is indicative of an improvement in environmental conditions and a reduction on the oxygen minimum zone”.

Warning ! There are few samples analysed; 4 samples in 10 m, it’s little. This interpretation does not seem really justified because the organic matter concentration is very high.

âĂć p.15 paragraph Âń Global trace metal draw-down during OAE-2” line 3, “During

the Cenomanian, sediments that have been influenced by tethyan waters”

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