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Climate of the Past Discussions

Interactive comment on "Central Tethyan platform-top hypoxia during Oceanic Anoxic Event 1a" *by* Alexander Hueter et al.

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The authors of this paper aim to test the hypothesis that low oxygen concentrations in coastal waters at times of widespread Cretaceous ocean anoxia (OAE's) had an impact on carbonate platform growth during times of C-cycle perturbations. The authors clearly formulate their hypothesis based on actualistic examples from a variety of coastal regions. Enigmatic microencruster blooms in Tethyan shallow water carbonate successions of Cretaceous age have repeatedly been described by numerous authors as correctly mentioned by the authors of this study. Therefore, a new and detailed investigation of causes resulting in observed changes in carbonate platform ecology seems timely and of relevance. The geochemical methods the research team is applying for reconstruction of oxygen levels are well explained and the authors seem

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to be aware of problems related to “contamination” of their carbonate samples (clay input, for example) altering carbonate geochemistry of their samples. In the following paragraphs, I like to add some comments which may help to further improve this manuscript.

1) The authors investigated a shallow water carbonate succession formed on the vast Cretaceous Adria carbonate platform. This section today is outcropping in Croatia. Stefan Huck and colleagues had published earlier studies, including stratigraphic investigations, on this section. Therefore, the authors of this paper only summarize stratigraphic information relevant for this study. If I look at the C-isotope stratigraphy presented in this paper, based on earlier studies, I still feel somewhat uneasy with the stratigraphic interpretation made by the authors. I like to refer to another, more recent study from Adria platform made by Sabrina Amodio and myself (2017). In this study (and in earlier ones by the Napoli groups) from the S. Apennines we succeeded in identifying the base of the Aptian positive excursion and the prominent short negative spike preceding this excursion. This pattern is not seen in the section from Croatia, either due to diagenesis or due to gaps in the record (?). In addition, we found a microencruster level in the Lower Aptian carbonates preceding OAE1a which possibly may be correlated with the level described in this study (?). I recommend that the authors have a look at this study and that they evaluate the possibility that the studied microbial level is of pre-OAE1a age. Is it possible that the section in Croatia corresponds to the Barremian-Aptian interval with microencrusters documented by Amodio and Weissert (e.g. Monte Faito ?). Even if the authors would come to the conclusion that the section may represent a pre-Aptian interval, the questions and related problems formulated by the authors remain of equal relevance. Numerous black shale deposits documented from deep Tethyan sections were formed also during pre-OAE1a times. It may, therefore, be hypothesized, that one of these pre-OAE1a anoxic events coincided with the prominent microencruster level described in this study.

2) Proxies - anoxia The authors present their data in nice graphic displays. Of course,

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the reader immediately recognizes that correlation between different proxies is not at all straightforward. Ce and U-isotopes seem to co-vary. However, the low oxygen levels inferred from these data do not perfectly well match with the microencruster facies. The authors refer in their text that low oxygen levels indicated by Ce-anomalies and U-isotopes coincide with peak encruster occurrence at the top of their C-3 interval (P 8 line 510). Please mark this peak episode in encruster occurrence in your graph. Differences in anoxia indicators deserve a more detailed discussion (local vs regional vs global signal).

3) Some minor comments p.2 Line 23 add Wissler et al., 2003 (first detailed documentation of C-isotopes and carbonate crises) p.7 line 15 (2at 6m) what do you mean? p.8 line 38 > there is some evidence from Nd isotope data, that a possible source of deep water in the Tethys (Late Cretaceous) was on the extended carbonate platforms > downwelling? or upwelling ? You may cite one of these studies, even if they give in formation on the Late Cretaceous (e.g. Martin et al., 2012). p. 11, line 23 There were abundant black shales also in the Barremian (Weissert et al., 1979, Bersezio 1993, Giorgioni et al., 2015), just to give some examples. These regional anoxic episodes could, in agreement with your hypotheisis, also have had an impact on shallow water conditions. p11, line 32 you may cite Méhay et al., 2009, this biomarker study provides detailed information on changes in pCO2atm at the base of OAE1a.

I consider the paper as a very valuable contribution to the discussion on conditions resulting in the repeated occurrence of microencruster facies in Barremian-Aptian shallow water carbonate successions. Integration of data from other available sections from Adria (Croatia, S. Apennines) in the discussion is recommended and this integration of other data may result in a critical discussion of stratigraphy and the difficulties in using chemostratigaphy in the sediments studied.

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