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Interactive comment

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

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Dear Dr. Weissert,

Thank you very much for carefully reading our manuscript and your detailed and insightful comments.

RC#1: Stratigraphic interpretation of the Kanfanar section

AR#1: As you already noticed, the biostratigraphy of the Kanfanar section is based on the occurrence of benthonic foraminifera (Palorbitolina lenticularis) as established in a previous study by Huck et al. (2010). We are aware of the difficulties regarding the stratigraphy of shallow-water carbonates and open for any further interpretations. The carbon-isotope pattern established for the Monte Faito section by Amodio and Weis-



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sert (2017) reveals many similarities with the Kanfanar carbon-isotope record. Having a closer look at the $\delta$13C pattern of the Monte Faito location, the positive peak of +4 ‰ (section meter 86) fits nicely with the +4 ‰ positive excursion (around section meter 30) in the Kanfanar section (rudist data). If this assumption is correct, the mass occurrence of microencrusting organisms (Lithocodium aggregatum and Bacinella irregularis) would not represent the Selli Level Equivalent, the latter being masked by a regional exposure surface higher up in the Kanfanar section (at section meter 32.5). This would lead to the interpretation of a pre-OAE 1a age for the studied microencruster interval in the Kanfanar section.

On the other hand, Huck et al. (2010) compared the $\delta$13C pattern of the Kanfanar section with the patterns of a composite section in Oman and the La Bedoule Section in France, presenting many similarities as well. These similar patterns share the strong positive peak in $\delta$13C of +4 ‰ (rudist shells in the Kanfanar section) and would rather support the current interpretation of the stratigraphic framework, additionally encouraged by Sr ages (Oman and Croatia).

Nevertheless, we are thankful for this helpful interpretation to this apparently very complex topic and will not exclude this possibility, due to the already known occurrences of L. aggregatum and B. irregularis before and after OAE 1a (e.g. Portugal and Oman). As you already stated, the connection of hypoxia or even anoxia and the massive occurrence of microencrusting organisms would not be affected by this new interpretation. Anyway, the biostratigraphy and the possible connection between OAE 1a and microencruster occurrences is very important for the understanding of these complex cause and effect patterns. Therefore, we will discuss this possibility in detail in a revised version of this manuscript.

RC#2: Maximum of oxygen depletion (as seen in uranium isotope ratios and Ce-anomaly values) coincides with the maximum abundance of microencrusting organisms at the top of chemostratigraphic segment C3.

AC#2: In your comment, you are referring to text that states that the maximum oxygen depletion (as seen in the geochemical proxies) coincides with the maximum abundance of microencrusting organisms at the top of chemostratigraphic segment C3. We agree that this statement is somehow misleading, as figure 3 shows the maximum abundance at section meter 17 and 22. Indeed, the abundance is already decreasing at the top of C3. The text should probably better read: At the top of the C3 segment, uranium isotope ratios and cerium anomalies indicate a maximum oxygen depletion, but the abundance of microencrusters is already decreasing. There are two possible explanations for this: (1) Regarding the complex morphology of L. aggregatum and B. irregularis (e.g. Rameil et al., 2010), the two-dimensional perspective in thin sections may induce some degree of data bias, i.e. the thin section area covered by microencrusters strongly depends on the plane of observation. Moreover, the abundance and the grown morphology may change due to changing environmental parameters. We are aware of this problem and took great care to compare observations from the field and thin sections observation to reduce any potential error to a minimum. Despite all our care, we cannot exclude, however, that some of the second order patterns are not, to some degree, influenced by these issues. In short, this is a complex, non-perfect, geological system and any sampling strategy may induce this type of problems. We are confident that the first order patterns are valid and can be replicated though. (2) The more likely interpretation is: The oxygen depletion is reaching its maximum at the top of C3 and becomes critical for even the hardiest organisms, exceeding their tolerance limits and hence they decline. We will change the relevant statements in the manuscript and discuss the possible explanations for the decrease in microencruster abundance despite persistent oxygen deficiency.

As a second important point of your second comment refers to the discussion of our geochemical redox proxies. We agree that uranium isotope ratios will preserve a global signal due to the long residence time of uranium in the global ocean (450 kyr). In contrast, cerium, with a residence time of a few hundred years, as well as the redox sensitive trace elements, will display a local or regional signal (Sholkovitz and Schneider, 1991; Shields and Stille, 2001; Bodin et al., 2007), supported by the long mixing time of the oceans (∼1000-2000 years). For this reason, we will add some text in the discussion that deals with the temporal level on which the redox proxies operate.

Minor comments: (1) P.2, line 23: We will add Wissler et al. (2003) as a further reference. (2) P.7, line 15: It should be "(at 26 m)" instead of "(2at 6 m)". Will be changed in a revised version. (3) P.8, line 38: We will add some new references and discuss the question of upwelling or downwelling. (4) P.11, line 23: We will discuss the possible impact of Barremian black shale deposition on the studied interval. (5) P.11, line 32: We will cite Méhay et al. (2009) to provide detailed information about the changes in pCO2 at the base of OAE 1a.

Thank you for you very constructive comments.

Sincerely yours, A. Hueter on behalf of the co-authors.

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