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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 paper by Hueter et al. is an interesting contribution to better understanding the environmental impact of the oceanic anoxic event (OAE) 1a on shallow-marine carbonate platforms. However, there are a few problems with the data presentation and interpretation that merit comment as well as the paper overlooks an earlier paper with a more detailed modified whole rock δ13C curve and facies work that documents hypoxia in southern Croatia (Husinec et al., 2012, 2018) and suggests that it occurred slightly later than hypothesized by the present authors.

The overall shape of the bulk carbonate matrix-based δ13C curve (Fig. 3) does not allow definite designation of the Menegatti et al. (1998) C-isotope segments. The

δ13C curve from Huck et al. (2010; their Fig. 10) has been modified by significantly shifting the segment C3 boundaries: the base of C3 is shifted $\sim$8 m higher in the section (i.e., from the upper Dvigrad to the base of Kanfanar Unit), and its top is now picked on top of the last microencruster occurrence, $\sim$7 m higher in the section (i.e., shifted from lower to upper Kanfanar Unit). Thus, they have significantly shifted their C3 pick up-section. The authors should acknowledge that and explain what the new picks are based on. The +/- 0.4 my error bars on the Sr-isotope ages are much larger than the interval the authors are trying to date – we suggest you put the error bars on the figure.

A comparison between the δ13C curve with all Menegatti et al. (1988) segments has previously been published for the southern Adriatic Platform by Husinec et al., (2012, 2018) and should be discussed. The overall shape of that curve, unlike the Huck et al. (2010) incomplete curve (segments C2 to C6?) used in the current study, suggests correlation with classic pelagic sections (e.g., Vocontian Basin - Föllmi et al., 2006) that places the hypoxic interval (shown in light grey as deeper lagoon facies on Fig 8) slightly younger than in the present paper. In fact, our S Adriatic δ13C curve (Husinec et al., 2012) closely resembles the Oman and SE France curves which clearly delineate the C3 segment. In Oman, the Lithocodium-Bacinella interval spans from uppermost C3 to C6 segments, similar to our dysaerobic laminated interval that is barren of any fauna and spans C4 to perhaps C7. However, if the relative ages between the Istria and southern Adriatic Platform do indeed differ, then it might suggest diachroneity in timing of hypoxia, perhaps due to differential warping of the platform.

The final and probably the most important comment is related to an episode of platform-top hypoxia during the OAE1a (their inferred C3 segment) that the authors nicely documented using the redox-sensitive trace elements and the cerium anomaly (Figs. 4, 5). The authors then suggest return to oxygenated platform-top waters during segments C4-C7 (Fig. 8D). There are several problems with this interpretation: (1) The studied section above C3 is designated as "C4-C6?", suggesting that the designation

of the C6 top is tentative. It is then not clear what makes the authors suggest that there was no hypoxia on the platform during stage C7 (the one that is not present at all in their section)? (2) Ce/Ce* indeed shows return to normal oxygenated water (Fig. 5); however, this trend is present only within the approximately lower $\frac{1}{4}$ of their segment "C4-C6?". No Ce/Ce* samples in the remainder of the segment to suggest changes in the platform-top water oxygenation levels; (3) the authors state that the "segment C4 is characterized by patterns in redox sensitive proxies typical of normal marine dissolved oxygen levels". First of all, and as previously mentioned, Figures 4-5 show the segment "C4-C6?", i.e., based on their δ13C curve, the authors can't pick the upper boundary of the segment C4. Moreover, the lower part of that same segment "C4-C6?", which could as well represent C4 only, shows the similar or even lower redox-sensitive trace-element values (As, V, Mo), thus suggesting possible continuation of hypoxia, not return to normal oxygen levels. Interestingly, in southern part of the Adriatic Platform, Husinec et al., (2012, 2018) have documented a 10-m-thick interval of platy, planar-laminated, fine pelletal lime mudstone that formed under dysoxic conditions, as evidenced by its texture, lack of any fossils and/or bioturbation, very dark gray to black color, and distinct petroliferous odor. This low-oxygen (hypoxia?) OAE1a platform equivalent appears to span from the upper part of C4 to the top of C7 (Husinec et al., 2012; Fig. 5), and may have filled local structural downwarps on the platform. The bottom line is that the Adriatic platform-top hypoxic events were not limited to the C3 segment of the OAE1a, as suggested by the authors based on the data from the NW part of the platform. The apparent younger development of hypoxia on the southern Adriatic platform during C4-C7 suggests that Fig. 8D needs to be modified or the C3 age of the hypoxia re-evaluated.

Sincerely,

Antun Husinec and J. Fred Read

References:

Föllmi, K.B., Godet, A., Bodin, S., Linder, P., 2006. Interactions between environmental change and shallow-water carbonate buildup along the northern Tethyan margin and their impact on the Early Cretaceous carbon-isotope record. Paleoceanography 21, PA4211.

Huck, S., Rameil, N., Korbar, T., Heimhofer, U., Wieczorek, T.D. and Immenhauser, A., 2010. Latitudinally different response of Tethyan shoal-water carbonate systems to the Early Aptian Oceanic 5 Anoxic Event (OAE 1a). Sedimentology 57, 1585–1614.

Husinec, A., Harman, C.A., Regan, S.P., Mosher, D.A., Sweeney, R.J., Read, J.F., 2012. Sequence development influenced by intermittent cooling events in the Cretaceous Aptian greenhouse, Adriatic platform, Croatia. American Association of Petroleum Geologists Bulletin 96, 2215–2244.

Husinec, A., Read, J.F., 2018. Cyclostratigraphic and δ13C record of the Lower Cretaceous Adriatic Platform, Croatia: Assessment of Milankovitch-forcing. Sedimentary Geology 373, 11–31.

Menegatti, A.P., Weissert, H., Brown, R.S., Tyson, R.V., Farrimond, P., Strasser, A., Caron,M., 1998. High-resolution δ13C stratigraphy through the early Aptian "Livello Selli" of the Alpine Tethys. Paleoceanography 13, 530–545.

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