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Solid Earth Discussions

Interactive comment on "An open marine record of the Toarcian oceanic anoxic event" *by* D. R. Gröcke et al.

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Dear József

We thank you for the positive statement about the purpose of our study in that it provides the "first credible evidence" of a deep-sea record. The white chert is a difficult layer to interpret and one of our authors has published on this previously. We are aware that this deep-sea stratigraphic sequence will always be enigmatic since our knowledge of the Early Jurassic palaeo-Pacific is very poor. In reference to the Wignall et al. (2010) paper: we have struggled also to directly compare our results to theirs. The only green-grey cherts that could correspond to Figure 7 in Wignall et al. (2010) is between 100–120cm in our Figure 2, below which there is a grey chert and black shales and grey shales. Of course the thicknesses of these units do not correspond

between our reports, however, the Wignall et al. (2010) paper has no biostratigraphy provided against the succession, whereas if it did then it would be easy to compare successions.

More work has been achieved on the radiolarian biostratigraphy of the Early Jurassic as shown by the Carter et al. (2010) paper, especially since the work of Hori (1997). However, it should be noted that the Napora relica – Eucyrtidiellum disparile Zone is approximated to the Early Toarcian and is close to the Pliensbachian/Toarcian boundary: this is confirmed by the carbon-isotope record produced in this report. We apologise for not explaining the radiolarian faunal composition panel in Figure 2: it was an omission.

Again we state that the sampling resolution is quite adequate for the succession. In some intervals it is on the order of every 5cm, whereas a distance of only 2 or 3cms separates some samples: this is not low resolution. We agree that we may have placed too much emphasis on the single value, but at least it was included. Unlike the suggestion by Bas van de Schootbrugge that, "such an outlier in a data set should either be ignored, or its uniqueness should be explored in great detail". At present we have no explanation for it and further investigation has not revealed any clearer understanding of the extreme negative value: such data should never be ignored by scientists, especially when it is reproduced many times in different labs.

We agree that we have over-simplified the long-term average sedimentation rate and we shall omit from the revised version, but only discuss it in the text: with the caveat that we have used a long-term average sedimentation rate.

The basic concept that increased organic carbon burial would lead to a positive carbon-isotope excursion is one that has been recorded previously for the Early Aptian and Cenomanian/Turonian boundary oceanic anoxic events. However, it should be noted that these peaks in TOC are very low considering, and is only defined by a few points especially for the Pliensbachian/Toarcian boundary interval.

Regarding the Pliensbachian/Toarcian boundary interval and our correlation. Yes, the

boundary is placed at -30cm but that is the best our current biostratigraphy can provide and the duration of the isotopic excursion that occurs at the Pliensbachian/Toarcian boundary is below the resolution of biostratigraphy. It should be noted also that the isotopic excursion occurs at the boundary and into the Toarcian as described by Littler et al. (2010).

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