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Climate of the Past Discussions

Interactive comment on "Orbital forcing of terrestrial hydrology, weathering and carbon sequestration during the Palaeocene-Eocene Thermal Maximum" *by* Tom Dunkley Jones et al.

Anonymous Referee #1

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I have no problem with different placements of the base of the CIE. With the available data it could be at the base of the greenish marls, or at the base of the SU. Perhaps we are dealing with an unusually complete and expanded registration of the onset of the CIE in this section? So it is fine with me to keep the base of the CIE where the authors have placed it. This suggestion is as good as placing it at the base of the greenish marls.

The long discussion about turbidites by the author is really redundant and bypasses my main criticism. My point has not been that there should be turbidites in the Zumaia PETM interval but that a high frequency of stochastic turbidite deposition recorded

in the nearby Ermua section indicates a likely distal (stochastic) contribution of fine-grained clastic material also to Zumaia. This contribution may not be discernible as discrete layers in Zumaia. But this is just a suspicion, and I can't prove it.

But the turbidite issue has little to do with my main criticism that remains. The paper does not explain, or attempt to explain, very well why Si/Fe ratios vary through the SU (from a lithological, mineralogical, sedimentological perspective). The fact that Si/Fe shows some correlation with limestone-marl alternations below the PETM probably reflects that Fe occurs both in precipitates (e.g. iron hydroxides etc) and in clastic material, whereas Si is mainly in the clastic fraction. In a limestone the amount of pores, i.e. Fe precipitates, will be similar as in a marl, but the amount of Si-carrying clastic material will be lower. So Si/Fe ratios will go down. And why is there no correlation between Si/Fe and Ca in the PETM/SU interval?

The question remains, why would Si/Fe ratios vary because of climate through the PETM interval. Is it different types of clay minerals with different Si/Fe ratios being transported under different climate conditions? Is it grain size of the transported material that changes with changing climatic conditions, and that different grain sizes have different Si/Fe ratios (perhaps variations in quartz)? Much information about this could have been obtained from data on other major oxides through the section, e.g. TiO2 can vary with grain size reflecting changing amounts of heavy minerals with different strengths in hydrodynamic regime, MgO or K2O versus Al2O3 ratios could tell about differences in clay mineral assemblages. Simple SiO2/Al2O3 ratios would give a lot of additional insights. If such ratios go up, we may be dealing e.g. with Si from benthic agglutinated foraminifera (that are abundant though the SU).

As the paper stands now with an almost "mystical" trust in "magic" Si/Fe ratios I do not think it is a strong paper. There has to be some way to back up the Si/Fe ratios by showing that there is at least one other lithological/sedimentological/mineralogical parameter that also tracks the proposed cycles.