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Interactive comment on "Amelioration of marine environments at the Smithian–Spathian boundary, Early Triassic" *by* L. Zhang et al.

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This manuscript reports stable isotope and elemental records across the Smithian-Spathian boundary from shallow carbonate platform section of South China. Main arguments are (1) sedimentary flux decreased during Smithian-Spathian transition, (2) redox environment was oxic to suboxic and not anoxic, and isotope ratios of carbon and sulfur of carbonate vary in inverse relationship. Their data and discussions are worth. But, I would like the authors to improve their discussions.

First, authors suggest sedimentary flux variations across Smithian-Spathian focusing on clay and carbonates. Probably they calculated the sedimentation rates using thickness of lithologic column, elemental ratios such as Th/Th*, and absolute age referred from previous reported radiometric ages. But as their calculation process is not shown

in the manuscript, readers can not evaluate their calculation results. I ask authors to explain their methods of sedimentary fluxes estimations including calculation formula, assumed ground with some literatures. Further, authors should mention that most of the absolute age numbers have some error ranges. So, they should discuss uncertainness of absolute numbers of their calculated fluxes and/or their estimations are maximum or minimum estimate. Similar points are found in their conodont occurrence ranges in Figure 1. They can not place Nv. pindingshanensis zone at the base of Bed 14 of the study section because of lack of fossil occurrences. I recommend authors to show such fossil barren horizon as spaces (no color in Figure for example) or "transitional zone" in the Figure.

Second, the authors discussed redox condition of the Shitouzhai section using multi elemental proxies. In the first sentence of this discussion part, they argue that redox-sensitive elements of Mo, U, and V are low. But we can not find their data in any tables, despite authors refered "appendix Tables" in sentence (Line 302). So their criteria of "low in all samples " are uncertain.Authors should indicate their definition of low value. When doing so, enrichment factor (e.g. Tribovillard et al., 2006) would provide useful tool for comparison with each redox conditions. Also, author's criteria of Mn enrichments is not clear. Relatively high Mn/Th in 20-37 m horizon are interpreted as evidence of sub-oxic conditions. But it is uncertain why interpretation as oxic condition can be ruled out. In this paragraph, they introduce Mn's pass way, "reducing deep water mass provide soluble Mn to neighbouring oxic water mass " and "Mn deposition occur in oxic-suboxic depositional condition". Using these facts and combination with other redox proxies, more organized explanations on redox environment are required.

Third, authors discussed chemical weathering intensity using CIA (chemical index of alternation). As previous researchers mentioned (examples are following), this elemental ratio can also vary reflecting changes in provenances of sediment. Authors might want to discuss on this possibility. Perhaps, effect of provenance variation could be discussed by Eu-anomaly and REE features.

Borges, J., Huh, Y., 2007. Petrography and chemistry of the bed sediments of the Red River in China and Vietnam: Provenance and chemical weathering. Sediment. Geol. 194, 155–168. doi:10.1016/j.sedgeo.2006.05.029

Price, J.R., Velbel, M. a, 2003. Chemical weathering indices applied to weathering profiles developed on heterogeneous felsic metamorphic parent rocks. Chem. Geol. 202, 397–416. doi:10.1016/j.chemgeo.2002.11.001

Fourth, they pointed significance of Smithian-Spathian Boundary as the turning point of oceanic structure from "hyper green house (they assume stratified ocean) to “over turning circulated ocean”. But negative co-variation of dC and dS could already be recognized in late Smithian warm period. In fact, during negative trough of d13C in Bed 8-13, d34S increase, although resolution of d34S is not so high as authors mentioned. I doubt their argument of coincidence of transition of sulfur isotope profile and cooling trend. They need some explanations on this trend.

Finally, I can not find this paper’s contribution from the final section of discussion (5.3) on temperature, vegetation and Siberian trap volcanic activity. Authors should indicate the significance of sedimentary flux and features of oceanic condition in Smithian-Spathian interval, reviewing previous issues.

I also show minor issues herein.

Line 33: This paper can not discriminate the cause of Smithian -Spathian warm and following cooling condition.

Line 53: What is extreme environmental condition? temperature in concrete ?

Line 98: It is better to make an explanation of carbon isotope notations N3 in first.

Line 100, 101,109; What are criteria of “grobally” “world-wide”? In fact, several sections support carbonate carbon isotope variations during Early Triassic.

Line 128: absolute age must have error ranges. "$\sim$252 Ma" means maximum assump-

tion?

Line 189 and figure explanation of Fig.3: It is not enough for explanation of sedimentation flux calculations.

Line 202: Still needing explanation on N3, P3, and N4 by Song et al.

Line 324: suboxic trend is discussed by covariance of another redox indicator together.

In Figure 5-B, ammonite or benthic foraminifera (?) is drawn on the deep-seafloor. I think there are few evidence of that "bio-diveristy loss" of calcareous animals occur pelagic deep water region. This figure leads to misunderstanding. Biodiversity loss would be occurred on shallow platform at least.

In Table S1, Mn/T should be “Mn/Th"

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