

The Permian-Triassic transition in the Blue Nile Basin: insights from petrography and geochemistry of sandstones

Mansouri et al

This manuscript details petrographical and geochemical changes to a selection of sandstones straddling the Permian-Triassic boundary, famed for its accompanying mass extinction and apparent extreme environmental conditions. I believe the manuscript will ultimately make a good contribution to *Earth Surface Dynamics*, following completion of a series of minor comments (listed line-by-line, below). More substantially, considering the meat of this paper is how the chosen sandstones archive the environmental conditions which typified this period of geological time, there is a surprising lack of detail on the inferred environments of deposition (sedimentary facies work) for the selected samples. This does not need to be overly detailed, but at least an appreciation that the depositing environments can have a significant role in ultimate sandstone petrography, regardless of any allogenic climatic forcings, wouldn't go amiss. I suggest an extra section with about one paragraph of text per sample detailing: 1) the environment in which the sample was chosen (braided, meandering, beach etc etc); and 2) what reasoning was used (by the present authors of cited works) for determining that environment. This would strengthen the arguments made throughout the text. For instance, right now the reader may be left wondering, "sure sandstone is more mature at X time, but perhaps the sample was taken from the lower reaches of an alluvial Plain, or beach or upper shoreface etc, where shoreline processes (e.g., longshore drift) will result in more labile minerals such as feldspar being destroyed." You are not comparing like for like (i.e, the same depositing environment either side of the boundary) so remarks on how you know that differing sedimentary conditions (mechanical) do not impede the authors view on global climatic changes are necessary.

This will require additional text in an already (probably) overly long manuscript. So the second main point is to ask if the authors think they can write their findings a little more succinctly in certain places. Often the text labours the point, repeats passages already referred to, and regularly lacks links to figures or referenced works (I have pointed out such passages in the text). Note this is just how the manuscript comes across to an independent reader – we're all different and not proposing this is a big problem. I just believe the same information could be

provided a little quicker, and more guidance to the relevant figures would help this information come across.

Finally, throughout the manuscript I have detailed instances where the GSA geologic timescale (Walker et al., 2018 Geological Society of America) is not adhered to. Whilst this may seem overly pedantic, I do think it's important that we all follow one scheme. This text is constantly referring to ages/Periods, so it's important these are listed by an accepted scheme. One thing that may help is an additional "geological/stratigraphic setting" section, a dedicated portion of the text where the ages/units/locations of the samples are listed.

I wish the authors every success with their submission.

William McMahon

Line-by-Line comments

Line 8. Capital e in Earth

Line 12. "differences"

Line 12. Permian epochs are not defined as "early" or "late" so these should not be capitalized. This is not the case for the Triassic, where "Late" Triassic (capitalized) should be retained.

Line 16. Perhaps it's beyond the scope of the paper, but a sentence or two in the abstract justifying why the succession, in the author's opinions, was deposited by "alluvial and braided systems" within a "semi-arid climate", wouldn't go amiss.

Line 22. "became" – it's already happened. Unless the authors mean "In the Middle to Late Triassic "strata", sandstones become.....".

Line 31. "went" extinct.

Line 32. This statement needs a reference.

Line 32. Try "coeval with this biological extinction" (don't think you need to term "huge", it's significance is well known and has been emphasized in the previous sentences).

Line 37. Reference needed.

Line 38. "played".

Line 39. "Other causes in discussion, such as "an" asteroid impact or supernova [don't need explosion], remain purely speculative". I don't think this sentence is needed, would consider removing.

Line 40. "However, the exact causes [triggers?] of this event remain unresolved".

Line 50. Delete "time"

Line 54. Lower case e in early Silurian. Lower case e in early Carboniferous (unless you choose to specifically refer to either the Mississippian or Pennsylvanian). Lower case e in early Permian.

Line 55. "early Permian", late Permian, (keep Triassic as is).

Line 60. Capital e in Earth.

Line 76. 'late' Neoproterozoic and 'early' Cambrian.

Line 82. 'middle Cambrian' (though Ordovician remains capitalized). (Actually using the stage names, if known, would help with all these changes).

Line 83. 'early' Silurian, 'late' Carboniferous, 'early' Permian

Line 87. 'early'-'late' Oligocene

Line 105. 'late' Palaeozoic' (switching between 'palaeo' and 'paleo' throughout – choose one and be consistent, perhaps the journal has a preference).

Figure 2. These are not the GSA Geologic timescales in wide use. Recommend switching up [go to GSA website and find most recent geologic timescale (v5.0)].

Line 124. 'late' Carboniferous (and line 127).

Line 129. 'late' Permian. (and line 133).

Line 146. 'a' further

Line 153. Stopping recommendations on capitals in epoch subdivisions now, but aim for correct all these in the resubmission (including figures, e.g., Figure 3).

Line 224. Delete 'shapes' – unnecessary

Line 300. Delete "grains"

Line 300. "Apatite" grains are almost "always(?)" angular to sub..."

Line 308. I think this sentence needs restructuring (perhaps less conversationally). As presently written I cannot make sense of it.

Line 311. "In the early Permian samples, the ZTR index is low, before increasing in the late Permian to Triassic, and dropping again in the Late Triassic."

Line 312. "The ATi is high in the early Permian, before dropping in the late Permian–Late Triassic."(?). I suggest a reword of the following sentence as well, but uncertain what suggestion to make here (but the point is not being made at present).

Line 317."recycling of glacial deposits, as well as climatic drivers, including the expected extreme conditions around the PTB".

Line 319. "compositionally" immature? If texturally the preceding part of the sentence covers this. Could also delete the entire rider of the sentence: "The petrographical analysis shows that the XXXX" and start on "Early Permian". It doesn't add anything.

Line 349. "have a patchy distribution"

Line 358. "are" dominated by....."variable amounts of garnet and monazite".

Line 361. "of" about 75%

Line 363. A lot of these results could be far better linked back to the figures in which the results were initially shown.

Line 367. "confirms this similarity and shows the same enrichments in Na, Mg, K, Ca, and Mn element concentrations, in addition to a complete overlap in the PCA plot".

Line 369. "quartzarenites"

Line 383. "in comparison" instead of compared.

Line 391. As "a" primary source. This statement feels like it needs a reference.

Line 392. This sentence is far too long, cannot make sense of it. Needs a reword.

Line 398. "Shield, including those in southern Ethiopia".

Line 399 "far-distanced" = "more distal"(?)

Line 402. Tenses all wrong in this sentence. Multiple options, please clarify. One composition? Multiple compositions? One differentiated crustal source? Or multiple crustal sources?

Line 402. The ZTR index is mostly between 70 and 90% - again links back to figures where this information can be found would be useful.

Line 403. "contributions"

Line 407. "The late Permian to Early Triassic Fincha Sandstone shows similar relative element enrichment to the Enticho Sandstone", [then I lose the meaning of the sentence] "and indicates a felsic source rock"(?). Please clarify/tidy up.

Line 415. Change "supporting" to "supportive".

Line 422. Where can this paleocurrent information be located?

Line 428. A few words on how vegetation-free conditions may be useful here (wealth of literature on this). Noting that by the Late Ordovician the continents weren't entirely vegetation free) – cryptospores of early embryophytes have been discovered (e.g., Rubinstein, C.V., Gerrienne, P., de la Puente, G.S., Astini, R.A. and Steemans, P., 2010. Early Middle Ordovician evidence for land plants in Argentina (eastern Gondwana). *New Phytologist*, 188(2), pp.365-369.

Line 436. This sentence emphasizes my stance on the lack of detail about where the samples were actually obtained. F1(?) and F2(?) – it's not immediately clear to me at this stage of reading where these samples are first introduced, had to go looking – link to figure caption. But more so it's just a blanked statement stating an environment and a climate, unreferenced and with no supporting evidence.

Line 438 “increasingly” diverse

Line 444 “display” (or “show”) lacustrine conditions. (more uncited, unbacked up sedimentological statements).

Line 450. “point to”...”overall reduced floral diversity”.

Line 488. This sentence needs a rewrite, errors in it at the moment.

I have not checked the reference list.