The terrestrial Permian–Triassic boundary event is a nonevent

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We are pleased to reply to Ward et al. (2012) about the stratigraphic record of the Karoo Basin where the terrestrial ecosystem response to the End-Permian extinction is recorded.

The present extinction model envisions a marine and terrestrial response coupling. The Permian–Triassic boundary (PTB), the zenith of marine extinction, is recognized at the first appearance datum of Hindeoetus parva in the Global Boundary Stratotype Section and Point at Meishan, China, associated with a negative δ13C excursion. On land, it is reported at the last occurrence of Dicynodon in the Karoo Basin (e.g., Ward et al., 2005) and elsewhere.

The Karoo’s last Dicynodon co-occurs with a negative δ13C excursion in a unique, laminated, meters-thick, sandstone-shale unit. This interval, termed the “event bed,” is “associated with the P-T extinction” (Smith and Ward, 2001, p. 1148), and described as an “anomalously lifeless bed immediately above the last occurrence of Dicynodon” (p. 1149). The negative δ13C trend was used to correlate marine and terrestrial records, and the base of this facies is the datum to correlate boundary sections basinwide (e.g., Ward et al., 2000, fig. 1; Ward et al., 2005, fig. 2). Botha and Smith (2006, p. 503) report that this “regionally extensive interval of maroon coloured thinly bedded laminates” allows for correlation between Graaff-Reinet and Bethulie, >150 km distance, following Retallack et al. (2003, p. 1135). Hence, this facies correlation serves as a time marker across the Karoo. We are not alone in our understanding that this is the terrestrial expression of the isotopic anomaly and PTB identified in the marine record.

Erwin (2006, p. 142–143) states that “the shift in isotopes occurred in a finely laminated mudstone bed between the Permian olive-gray mudstones, and the overlying Triassic maroon mudstones and large sandstone beds.” He notes a remarkable similarity in δ13C trend between the Karoo and Meishan, and that the Ward et al. (2005) study, of which he is co-author, “strongly suggests that the overlap zone coincides with the marine Permian-Triassic boundary” (Erwin, 2006, p. 141). Similarly, Benton (2003, p. 220), referencing Smith and Ward (2001), remarks that they “pinned down the exact position of the Permo-Triassic boundary in the Beaufort Group sequence,” at the base of the laminites.

Our results generally agree with Smith (1995) where a transitional stratigraphy shows evidence of increasing crevasse splay progradation in hydromorphic paleosols. We interpret the laterally and vertically discontinuous heterolithic intervals, the boundary facies, as avulsion channel fills (Gastaldo et al., 2009) in a paleosol sequence, and demonstrate the facies is not restricted to a single stratigraphic horizon. It occurs both below and above the biostatigraphically defined PTB (e.g., Prevec et al., 2010), and Ward et al. (2012) acknowledge this observation. We now are a bit confused with their paleosol designation and Triassic age assignment of the thick, concretion-bearing paleosol. They now assign the western interval to a Karie pedotype (Triassic), distinctive from the Num pedotype “in the scheme of Retallack et al. (2003).” Retallack et al. (2003) neither report, define, describe, nor illustrate a Num pedotype in their paleosol scheme; it is not part of their GSA Data Repository item 2003122.

REFERENCES CITED


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GEOLOGY FORUM, March 2012 e257