Comment on “Fusiline biotic turnover across the Guadalupian-Lopingian (middle-upper Permian) boundary in mid-oceanic carbonate build-ups: Biostratigraphy of accreted limestone in Japan” by Ayano Ota and Yukio Isozaki

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The recent paper by Ota and Isozaki (2006) is an important contribution to ongoing studies of the Permian world and the mass extinctions marking the ends of the Middle (~260 Ma) and Late Permian (~251 Ma). Both events were considerably larger than the Cretaceous-Tertiary boundary episode (e.g., Sepkoski, 1996), and their separation in time of just nine million years suggests that the environmental system of Permian Earth was particularly vulnerable to stress. Thus, a detailed understanding of the two extinctions, including their causal mechanisms, as well as the background state of the intervening interval would tell us much about the planet’s biological development over this key period.

The study by Ota and Isozaki (2006), as well as a related one by Isozaki and Ota (2001), focused on two sections spanning the Middle-Late Permian boundary in atoll-cap terranes at Kamura and Akasaka, SW Japan. The limestone sequences accumulated atop seamounts somewhere in the huge Panathlassa Ocean (“proto-Pacific”) accreting to East Asia sometime in the Late Triassic-Jurassic-Early Cretaceous. The sections provide a particularly detailed record of the end-Middle Permian (end-Guadalupian) killing event, the fusilinid fossils suggesting a protracted interval of high-stress at the boundary. The pattern is similar to that identified in Guizhou Province, SW China, by Yang et al. (1999, 2000).

Ota and Isozaki (2006) consider that large-scale explosive volcanism may have triggered the killing although they do not specify an extinction mechanism. Interestingly, however, they repeat a claim made initially in Isozaki and Ota (2001) and later in Isozaki et al. (2004), that the voluminous (0.3–0.5 × 10⁶ km³: Ali et al., 2005; Xiao et al., 2004) end-Middle Permian eruption of the Emeishan Basalts in SW China (in Sichuan, Guizhou and Yunnan Provinces) were not responsible. This notion is based on the idea that basaltic provinces such as the Emeishan do not produce explosive eruptions. Whilst a cause-effect relationship has not been established, the available data suggest that the emplacement of the Emeishan Basalts and end-Guadalupian extinction were essentially contemporaneous (e.g., Ali et al., 2002; Zhou et al., 2002). Critically, although the Emeishan LIP is dominated by basalts, like many other continental large igneous provinces (e.g., Yemen: Menzies et al., 1997; Paraná-Etendeka: Peate, 1997; Karoo: Marsh et al., 1997), the later stages of volcanism included acidic eruptions. For example, work on the Emeishan LIP main basalt sequences and volcanic waning intervals at Emeishan and Ebian in central Sichuan (Thompson et al., 2001), and He Ba and Xiong Jia Chang in western Guizhou (JRA and colleagues, 2005 fieldwork) has identified felsic tuffs, pyroclastic flows and ignimbrites (Fig. 1). Towards the western edge of the LIP at Binchuan, Yunnan (where the sequence is >5 km thick), rhyolitic lavas are intercalated with basalt flows (Xu et al., 2001; Xiao et al., 2003) (Fig. 1). We suspect that in the Chinese literature numerous county-level geological reports include descriptions of Emeishan Basalt sections with associated acidic rocks, particularly in the waning interval rocks which are commonly assigned to the Hsuanwei Formation.

We therefore contend that the basic claim of Ota and Isozaki (2006); Isozaki and Ota (2001); Isozaki et al. (2004), that the “Emeishan Basalts” do not contain acidic
volcanic products is wrong. Considering the close synchronicity between many of the largest mass extinctions and LIP emplacement events (Wignall, 2001), the idea of dismissing the Emeishan province as the trigger for the end-Guadalupian episode has, at this juncture, to be considered premature. We anticipate that ongoing work on both the LIP and the adjacent marine platform sequences that accumulated on the South China craton /C24 260 Ma will yield much useful information with which to evaluate a linkage, if any. Beyond China, correlation with the Panthalassa-terrane sections now in Japan (Ota and Isozaki, 2006) will prove important for deciphering what really happened at the end of the Middle Permian.

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References


