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Comment on cp-2021-96

Gregory Retallack (Referee)

Referee comment on "Multiple Proxy Estimates of $p\text{CO}_2$ in the Hauterivian–Barremian of the Laiyang Basin, Eastern China" by Peihong Jin et al., *Clim. Past Discuss.*,
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This is a good paper on an interesting question of international interest: reconstructing atmospheric carbon dioxide levels from several different models of stomatal index and plant isotopic composition for fossil plants of several levels from the Early Cretaceous period. The values are not wildly different from modern industrial atmosphere, which may surprise some who view the Cretaceous as a greenhouse period.

Can an age model of age for each stratigraphic level be constructed from the radiometric dates (I104)? This would put a more accurate age on the fossils studied here. It would be good to make the new data larger in Fig.6 so it is easier to see the new contribution, which seems to be only a few data points.

The estimates of Retallack 2001 used in Fig. 6 have been recently recalibrated by Retallack, G.J. and Conde, G.D., 2020. *Deep time perspective on rising atmospheric CO₂. Global and Planetary Change*, 189, p.103177. Barremian and Aptian values calculated were 281-303 ppm, most like the isotopic model employed here. One spike of 969 ppm corresponds with OAE1 in the ocean and of 307 ppm with the Weissert event. These were not from USA as shown in Table 6 but from China, Australia and Argentina.

The Weissert event is here attributed to Parana-Etendeka flood basalt volcanism (I.465), but the marine signature is a positive isotopic excursion, which is the opposite of negative excursions found with other carbon dioxide greenhouse spikes at flood basalt events such as at the Permian-Triassic and Cretaceous-Tertiary events. Positive oceanic excursions are generally attributed to increased planktonic productivity and carbon burial in the ocean, and so reduced atmospheric carbon dioxide. Weathering of basalt (I.470) is a less convincing explanation for CO₂ drawdown, as basalt is fine grained and more difficult to weather than loess and granite, which are weathered more during greenhouse spikes.

I.23, 206, 350, 437 Carboniferous should have capital "c".

I.84 "One of the most desirable areas to study" is a curious way to introduce it without explanation why it is so desirable.

I.148 What is meant by 'last second' or 'last third'? Secondary branches? Tertiary branches? Penultimate? Antipenultimate?

- 182 delete "to" in this sentence

I.307 VPD standard is scarce nowadays: was it or Vienna PBD used?