

Interactive comment on “Life and death in the Chicxulub impact crater: A record of the Paleocene-Eocene Thermal Maximum” by Vann Smith et al.

Vann Smith et al.

vannpaleo@gmail.com

Received and published: 30 July 2020

Many thanks for your comment, Dr. Jaramillo! We will respond to your points in order.

1. Wing et al. (2005) calculated anomaly values of $\delta^{13}\text{C}_{\text{org}}$ based on a logarithmic regression of $\delta^{13}\text{C}_{\text{org}}$ versus wt. % Corg in terrestrial paleosols. These anomalies were given to account for isotopic enrichment by soil microbes. However, in our marine section, the carbon isotope signature is also affected by the proportion of terrestrial versus organic matter, as well as other factors, and we do not think that the relative contribution of these variables can not be deconvolved into anomalies based on a simple linear regression.

2. We are happy to cite the TEX86 data from Jaramillo et al. (2010), this is an important comparison.

3. Not only is the relative abundance of fungal spores versus pollen higher in the PETM samples than all other samples in the Site M0077A core, the absolute concentration (specimens/gram) of fungal spores is higher than all other samples, including samples in the later Ypresian section near the top of the core with much higher pollen and plant spore concentrations (over 10,000 grains/gram at some depths) than the PETM samples. Taphonomic processes which would preferentially preserve fungal spores compared to pollen would increase the relative abundance of fungal spores in the palynomorph assemblage but would not explain the higher concentrations of fungal spores relative to later Ypresian samples with excellent preservation. This has been clarified in the results section, and additional discussion about the possible paleoecologies of the aff. *Nigrospora* spores has been provided. Elsewhere in the Gulf Coast (Demchuk, Denison, and O'Keefe, unpublished data) higher concentrations of fungal spores in terrestrial and nearshore PETM sections have been observed along with near static levels of terrestrial palynomorphs; of the fungal spores, aff. *Nigrospora* sp. are most common. This suggests two things: 1) that there were increased moisture levels at the time, which A) increased decomposition, (Wang et al. 2017; Dighton 2016) and B) resulted in increased runoff, thus bringing palynomorphs into the Gulf of Mexico; and 2) that increases in terrestrial run-off may have led to higher productivity noted in overlying samples because the actions of saprotrophic fungi result in the release of soluble nutrients into the environment that would otherwise be immobilized in plant tissues (Dighton 2016).

4. Your point is well taken. The sentence “Low abundances of grass pollen (*Monopropollenites annulatus*) in the PETM suggest a minor grasslands component of the flora” has been removed from the text. References to “grassland” have been removed. The presence of only a single specimen of probable grass pollen in the PETM assemblage indicates that extensive grass cover was not present in the pollen source area.

[Printer-friendly version](#)[Discussion paper](#)

5. The range given for *Liliacidites variegatus* in the original description by Couper (1953) is Upper Cretaceous to Lower Oligocene for New Zealand. Elsik (1968) observed *L. variegatus* in the Paleocene of Texas, and Rouse and Matthews (1988) observed *L. variegatus* in the Eocene of British Columbia. Additional Cenozoic occurrences of this species can be found in Palynodata Inc. and White (2008), or online at paleobotany.ru.

Couper, R. A. (1953). Upper Mesozoic and Cainozoic spores and pollen grains from New Zealand (Vol. 22). Alexander Doweld.

Dighton, J. (2016). Fungi in ecosystem processes (Vol. 31). CRC press.

Elsik, W. C. (1968). Palynology of a Paleocene Rockdale lignite, Milam county, Texas. I. Morphology and taxonomy. *Pollen & Spores*, 10, 263-314.

Jaramillo, C., Ochoa, D., Contreras, L., Pagani, M., Carvajal-Ortiz, H., Pratt, L. M., ... & Rodriguez, G. (2010). Effects of rapid global warming at the Paleocene-Eocene boundary on neotropical vegetation. *Science*, 330(6006), 957-961.

Palynodata, I., & White, J. M. (2008). Palynodata Datafile: 2006 version.

Rouse, G. E., & Matthews, W. H. (1988). Palynology and geochronology of Eocene beds from Cheslatta Falls and Nazko areas, central British Columbia. *Canadian Journal of Earth Sciences*, 25(8), 1268-1276.

Wang, M., Liu, F., Crous, P. W., & Cai, L. (2017). Phylogenetic reassessment of *Nigrospora*: ubiquitous endophytes, plant and human pathogens. *Persoonia: Molecular Phylogeny and Evolution of Fungi*, 39, 118.

Wing, S. L., Harrington, G. J., Smith, F. A., Bloch, J. I., Boyer, D. M., & Freeman, K. H. (2005). Transient floral change and rapid global warming at the Paleocene-Eocene boundary. *Science*, 310(5750), 993-996.

Interactive comment on *Clim. Past Discuss.*, <https://doi.org/10.5194/cp-2020-51>, 2020.