

Review: Luciani et al.

The paper presents the first detailed assemblage counts of planktonic foraminifera through an important interval of extreme Cenozoic climate (early Eocene climate optimum, EECO) together with new stable isotope data. Information from three widely separated localities (Pacific, Atlantic and Tethys) show similar isotopic and assemblage changes, most notably a switch in dominance from morozovellids to acarininids which seems closely coincident with the start of the EECO, possibly the so-called 'J-event'. The authors speculate that this may have had something to do with symbiont loss or other factors during the extremely warm EECO.

This basic observation is new and interesting and, with the isotope data, suitable for Climate of the Past. However the study is limited by the absence of any quantitative species level information - the counts are lumped at genus level so separating extinction from abundance change is not easy. The authors state that the decline of the morozovellids seems to be across the board rather than because of the loss of one or other lineage. Another limitation, when it comes to interpreting the pattern, is the lack of species-specific isotope data / paleo-environments and evidence for symbionts as might have been attempted at Shatsky Rise and Blake Nose.

My overall interpretation is that a very interesting pattern of foram assemblage change has been identified but the interpretation and links to climate are rather speculative. Nevertheless, I think the paper will make a useful addition to the literature on a neglected but climatically interesting interval.

My main concern is potential over-interpretation of 'carbon isotope excursions' (CIEs). A number of these are claimed for the EECO, and they are numbered in the figures, but for me a bona fide 'excursion' ought to be defined by a series of points, not a single one. The Possagno section is affected by foram shell infilling which could well add noise to the record and give spurious so-called excursions. Allocating to these points the same numbers in different sites implies correlation that I find highly doubtful. It may turn out that they really are short-lived global excursions, which might be the most exciting new finding here, but that has not been demonstrated. My recommendation is that those parts of the manuscript are rewritten with much more caution, or higher resolution isotope data are obtained to show that these are well defined excursions and not 'noise'.

Some minor and additional points:

19-22. This claim appears to be 'global' but it is based on just three locations. What about the high latitudes?

35. 'Demise of the morozovellids' implies the genus went extinct but only some species went extinct. The phrase is over-used in other places too.

47-48 Was the EECO warmer than the PETM?

95 Note we tested specifically for environmental versus biotic influence on evolution and found both to be significant (Ezard et al., 2011, Science).

108 meaning not clear. Muricae are essentially layered pustules

114-115. Also 398. What is the meaning of well-preserved? Generally they are recrystallized except in clays.

137 Point (i) - I don't understand. Who says the temperature defines time?

154-155 exactly what is meant by the onset of low d18O values? I think I know what you mean but the trend towards lower values starts before the petm.

182-183. Comment: this seems a reasonable working definition of the EECO to me.

325, 350, 354 and elsewhere: delta not d

330, 336-338 What is a carbon isotope excursion. Is a single extreme number and excursion? I think an excursion should be defined by multiple points so as to rule out the possibility of noise. Hence I am not convinced these are real excursions although they may be. 371-372 equates lone negative values with excursions.

350 below the petm, not prior

430-431 morozovellid abundances (not morozovellids)

449-452 How much of this mirroring of morozovellid decline and acarininid increase is due to autocorrelation. What other genera are present other than Subbotina?

584 font size

586-7 check grammar

631-633 For more on d18O and temperature on Shatsky Rise see Dutton et al., Pearson et al. (2007, Geology) and comment and reply by Dutton, which deals with species issues as well. We proposed the then-controversial notion that temps were underestimated by over 10 degrees because of sea floor dissolution.

677 Never reversed is better than irreversible

795 Actually there is good evidence the hantkeninids moved from subsurface to shallower habitats in the Eocene (Coxall et al., 2000, Geology)

812, also 862-3 as previously, not all morozovellids died out in the EECO - better demise of some morozovellids

842 which others?

1435. The phylogeny in Aze et al in this interval is taken pretty much from Pearson et al. (2006)

Paul Pearson, December 2015