Review of Agnini et al.

This paper characterizes the PETM carbon isotope excursion at the Cicogna section and puts the calcareous nannofossil changes observed there into this context. The title makes claim to explain the detail of P/E global carbon cycling, but this is not accomplished in anything more than a descriptive way. Essentially, the authors only identify the PETM CIE at Cicogna and look at the nanno assemblage changes and compare those changes to other sites. There is no modeling of the carbon cycle, etc. I suppose an observational template is useful but hardly seems novel considering how the PETM has been beat to death and we still don't understand what caused it at a very fundamental level.

There is a great deal of folderol in this paper on other CIE's with close proximity in time, and speculation on what they may or may not mean and why they do or do not correlate to this section, etc etc etc. I would suggest scrapping all this and moving the discussion of those other CIE's to another paper as they are very distracting. The PETM is complicated enough without these other (probably mechanistically unrelated) CIE's muddying the waters. I recognize Dickens' prose on those sections (I review a great deal of his work) and so the motivation becomes fairly transparent as an agenda driven distraction rather than constructive comparison.

My other major comment is that if the authors want to compare the CIE at this site to any other site in the deep ocean, they must also compare it to site 690. That location has by far the most detailed deep-ocean isotope record (e.g., see Thomas et al 2002), which is quite a bit discordant with the bulk $\delta^{13}C$ shown here. At 690 the surface, intermediate and deep-water dwelling forams all show the excursion at a different time and with different magnitudes, beautifully recording the surface-to-deep perturbation. I cannot for the life of me understand why scrappy 1262 and (groan) 577 are used here instead of far superior 690. Is it the magnetics and nannos? . It almost appears as a deflection – can this record not be explained based on our understanding from 690? The comparison to the New Zealand records is of marginal usefulness and also distracting. No one uses that New Zealand slope work as a benchmark for anything. For CIE in robust shallow water or shelf locals, the Atlantic margin has a phenomenal record that is basically not acknowledged here.

I am not able to fully evaluate all the work on nanno assemblages. They look reasonable to me, but it should be no surprise to anyone that the timing does not line up with other locals. It is almost a guarantee that the absolute first/last appearance of taxa XYZ were not captured or recorded at this one site. The nature of biostratigraphy makes it ill suited for 'high-resolution' work in that way.

Overall, this paper tries to extend a great deal out of this data set but I think falls somewhat short, so the authors are left to pontificate on global trends and comparisons instead of interpret them explicitly. Stylistically I was somewhat irritated by the tone of the prose as quite preachy.

4332: similarity between the PETM and other hyperthermals is really not much more than an observational comparison – they are quite distracting here.

4335: This laundry list of why nannos are useful is missing one key assertion. Nannoplankton

live demonstrably within the photic zone and as such should be most senative to the air-sea gas exchange disequilibrium presumed to be present at events like this. It sure would be nice to see what the $\delta^{13}C$ change looked like in nannos…. If authors want to be serious about discussing a "Carbon cycle template", I think the real story is in the fine-fraction vs. foram isotope records from sites like this. With bulk measurements it is impossible to distinguish the two and that could be the reason for the discordance between magnitude of $\delta^{13}C$ change at this site vs. others.

4337-25: The Atlantic margin, particularly IODP Leg 174AX has been far more useful than these New Zealand records. The Rutgers group and the USGS have produced some really key shelf/shallow water records of the PETM – why special note to these New Zealand sections while the bulk isotopes from e.g. Millville are completely ignored?

4338-24: Those are really large samples, particularly when we can regularly measure 15-20 ug of carbonate.

4340: Why is this not compared to site 690? This site should be a benchmark for all deep-sea discussion of the PETM.

4341-29: I suppose for oceanographers this level of resolution is "high" but really isn't to the rest of us.

4346: Ignoring the Atlantic margin record seems a glaring omission.

4347: It's become abundantly clear that we cannot comment on the magnitude or speculate on carbon cycling from bulk isotope records. As the authors do note, it has become abundantly clear that the bulk records are discordant with e.g., single foram records, etc. and may or may not show the full $\Delta\delta 13C$. In fact, without knowing exactly who/what comprises this record it is not terribly useful for this type of work.

4347-18-21: Ah yes, cue the mysterious tipping point.

4348-5-10: Or the opposite! See Self-Trail et al 2014.

4349-7-15: And this has happened in a uniform manner? I really doubt it given the change in %CaCO3…

4349-21: What happens if there are changes much faster than this?? Uh oh.

4350: It is almost a certainty that the absolute first/last appearance has been missed (through no fault of the authors). I am not at all surprised that there are differences in timing and I think the authors are trying to do a little too much with this data.