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Interactive comment on "Stable isotope and calcareous nannofossil assemblage records for the Cicogna section: toward a detailed template of late Paleocene and early Eocene global carbon cycle and nannoplankton evolution" *by* C. Agnini et al.

Anonymous Referee #1

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Comments on the MS entitled "Stable isotope and calcareous nannofossil assemblage records for the Cicogna section: toward a detailed template of late Paleocene and early Eocene global carbon cycle and nannoplankton evolution" submitted by Claudia Agnini and co-authors as discussion paper to Climate of the Past

This is a very interesting paper that presents integrated calcareous nannofossils and stable isotope data at high-resolution, and addresses paleoceanographical, paleocli-

matic questions for one of the most impressive hyperthermal events of the Earth's history. I am quite impressed by the quantity and the quality of data presented in this paper. Of course, I have comments and remarks but these have to be seen by the authors as challenging questions aiming at improving their nearly excellent paper.

Methods

Preparation techniques. Semi-quantitative abundance of nannofossils can be biased by a variable rock powder concentration in different slides, because the preparation technique used in this paper does not guarantee a perfectly homogeneous distribution or constant quantity of material on different smear slide. In order to be sure that powder amount is comparable form a slide to another, you can weight cover slides once rock powder is spread on or, alternatively, evaluate the particle density under optical microscope using some table for evaluating grain density in a rock (e.g., Baccelle & Bosellini 1965). Of course, as you have studied here 200 smear slides, you cannot re-study all of them. However, I suggest you to evaluate the rock powder density in some 20 slides that will allow you to test this parameter and probably obtain an error bar of % of variation in nannofossil abundances from one sample to another.

PCA analysis. Although many nannofossil specialists, especially in deep time studies, apply PCA to calcareous nannofossil datasets, statistic and ecology specialists will tell you must not use PCA on this kind of dataset. There is a number of reasons why other techniques like non-metric multidimensional scaling or NMDS and CA are preferred over PCA, (1) PCA assumes that species have a linear regression with PCs, however, linear relationships in ecology are the exception and not the rule, (2) PCA is sensitive to zeros which is also quite common in palecological data on geological time scales, species that co-appear due to evolutionary patterns will group even if they inhabit different ecological niches. (3) Specifically, NMDS does not assume variable normality.âĂĺ In spite of these arguments, you may prefer to use PCA, but I suggest you to at least transform % values into log values in order to avoid the closed-sum effect.

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References for PCA. References here are very partial. Do you only quote works on Paleogene (in this case you should cite it)? Either you cite all the papers using PCA on nannos (which would be too much) or you cite the oldest works plus 1-2 significant papers discussing limits and advantages of using PCA on nanno %.

Discussion

Section 5.1 page 4347. Is this consistent with the fact that the PETM is preceded by several smaller CIEs? Would it be possible to make some simple mass-balance calculation in order to predict the mass of stored organic carbon needed to produce the PETM CIE after the B1/B2, C1/C2, D1/D2 CIEs occurred?

Section 5.5. This is a likely explanation, but the Cicogna section also received a more important terrigenous input than other "true" oceanic sites. Could this terrigenous input influence the δ13C record? What about the organic matter content of the section? Because, dissolved OM may release 12C and contribute to lower the δ13C values. Please, discuss also these alternative hypotheses.

Conclusions

This is rather a summary chapter. Either you name this 'Summary and conclusions' or you present the possible outlook of your work. E.g., the importance of studying more expanded sections in order to approach a paleoceanographic event, or the implications your work may have for a better comprehension of such events ...

Minor corrections

Page 4334, line 6. At the seafloor, not at the CCD? Page 4334, line 24. Rost & Riebesell, maybe quote earlier references. Page 4436, line 16, Why 1000 but not 1500 m depth? Please, provide a little explanation. Page 4436, line 16, Height or thickness? Page 4339, line 19. Longitudinal? Page 4343, line 7. Marginally? Page 4343, line 8. Absolute or semi-quantitative abundances? Page 4347, lines 8 and 9. You use twice 'must 'that is very strong. You can maybe use 'very likely' or something similar? Page

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4349, line 18. Means or mean? Page 4350 and following. Please, explain the meaning of B, T, Tc etc. the first time you cite them. This may help non-specialists Page 4353, line 9. Unsteady or transient? uneven? Page 4354, line 12 and following. Although K- and r-mode are terms used in works treating of fossil taxa, they must not. In fact, these are derived from measurements on living communities where the birth and death rates of organisms can be measured. I suggest you to use the terms 'specialist' and 'opportunist' instead. Page 4354, line 28. Habitat partitioning? Page 4355, line 11. Can extreme conditions be stable? The PETM is characterised by intense but transient paleoceanographic changes. How can such conditions be favourable for a supposed K-selected taxon?

Interactive comment on Clim. Past Discuss., 11, 4329, 2015.