

## ***Interactive comment on “Benthic foraminifera at the Paleocene/Eocene thermal maximum in the western Tethys (Forada section): variability in climate and productivity” by L. Giusberti et al.***

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### GENERAL COMMENTS:

The Authors provide new results on the response of deep-sea benthic foraminifera to the hyper-thermal event which occurred during the Paleocene/Eocene thermal maximum (PETM) recorded in the Forada section from the Western Tethys (Italian Belluno Basin). This is an excellent work, well organised and well written, with clear relevance and importance that fully matches the scientific profile represented by Climate of the Past. With this article, the Authors successfully contribute to shed light on the complex extinction dynamic of deep-sea benthic foraminifera across the PETM

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also reconstructing the environmental changes which probably occurred at the Paleocene/Eocene boundary. Their conclusions, deriving from new micropaleontological data integrated by published physical and chemical data, are very intriguing and helpful in improving assessments of the value of fossil marine biotic records to ancient global warming events, even in the context of current climate change. To know the past record in order to better understand the present and future response of marine organisms to global changes is very relevant today, as human society is grappling with its fate under the huge inputs of greenhouse gas emissions favouring unprecedented atmospheric CO<sub>2</sub> rise and major associated mysteries for the marine ecosystems. Some suggestions that might improve the current version of the MS are indicated below as “specific comments” and “technical corrections”.

### SPECIFIC COMMENTS:

1) Title: it is not fully indicative of the work here presented because the Authors combine new high resolution benthic foraminiferal results with published calcareous plankton, mineralogical and biomarker data to document climatic and environmental changes across the PETM. I suggest to change the title accordingly.

2) Introduction. This paragraph is very long and too condensed. I suggest to reduce it. Some parts could be preserved for the discussion sections (e.g. from 4208-line 26 to 4209-line 26).

3) Materials and methods. - Subparagraph 2.2.1: I fully agree with Speijer’s comment about how the ecological overview has been assembled. Please give more details of your explanation. Moreover, this subparagraph is too long and descriptive making it dull reading. I suggest to synthesize the benthic foraminiferal ecology into two tables deleting the descriptive parts. Some suggestions: the first table could report the main ecological preferences and microhabitats of the most common taxa recorded in the studied section; for each benthic taxon the table could include a first column with the known paleo-depth range, a second column with the mode of life (deep or shallow

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infauna and epifauna), a third column with the food supply (quantity, quality and periodicity), a fourth column with the oxygenation, a fifth column with the type of substrate and eventually a sixth column with other remarks. The second table could report the grouping taxa (R1, R2, O1, O2) and their occurrence in coeval records from the studied Forada section to other land sections or oceanic sites. Both tables should include a last column with the most relevant reference papers used to infer the ecological preferences. The descriptive parts (only when strictly necessary to the discussions) could be available as supplementary material.

4) Conclusions: this paragraph could be significantly streamlined omitting a few generic statements and organising it into point bullets reporting only the main concluding remarks.

5) References: the references list is consistent and updated, but some references cited in the text are missing or incorrectly reported in the reference list (e.g. different year of publication), conversely some references reported in the reference list are absent in the text. Please see below in the "Technical corrections" for further details. Moreover, some references in the reference list do not follow the guide of the CPD (non-abbreviated journals, missing Author' initials, misspellings). The reference list should be carefully checked, completed and corrected accordingly.

#### TECHNICAL CORRECTIONS

- 4206-line 14 and elsewhere: The term "agglutinant" is not fully appropriated, maybe "agglutinated or arenaceous". Please correct throughout the MS accordingly.
- 4207-line13: "Roehl" please replace with "Röhl"
- 4207-line 23: "Dickens et al. 1995" in the ref. list is reported as "Dickens et al. 1997", please correct/uniform.
- 4208-line 7: "Zachos et al. 2005" in the ref. list is indicated as "Zachos et al. 2015", please correct/uniform or add.

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- 4208-line 10: "The profound paleoceanographic. . ." new item
- 4208-line 16: Boscolo-Galazzo et al. 2014 is missing from the ref. list.
- 4208-line 20: "Paelike" please replace with "Pälike"
- 4209-line 7: "Krauss" in the ref. list is cited as "Kraus", please uniform.
- 4209-line 29 "Sluijs et al. 2007", is it 2007a or 2007b?
- 4212- line 22: "Foster et al. 2013" is missing in the ref. list. Please add it.
- 4213-line 20: "Hayward et al. 2012" is missing in the ref. list. Please add the ref.
- 4214-line 2: ". . .based on their abundance pattern in the studied and other PETM sections" please add some reference paper to support this sentence.
- 4215-line 21: "Alegret et al. 2011" is reported in the ref. list as "Alegret et al. 2010". Please correct or add the missing ref.
- 4216-line 1: "Ishman & Domack 1994" is missing in the ref. list. Please add the ref.
- 4216-line 29: "Steineck & Thomas, 1996" is missing in the ref. list. Please add it.
- 4218-line10: "Mancin et al. 2014" please replace with "Mancin et al. 2013".
- 4218-lines 11 to 18: "Caution is needed. . ." I would move this sentence at the beginning of the subparagraph dealing with the foraminiferal ecology.
- 4218-line29: "Roehl" please replace with "Röhl"
- 4220-line 11 and elsewhere: The AA use the terms "morphotypes, morphogroups and morphologies". Please uniform throughout the MS.
- 4221-line5: "opportunists" please replace with "opportunistic taxa".
- 4225-line1: I suggest to change in "Discussion" removing "environmental reconstruction" because redundant.

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- 4225-line13: Please change in “Alegret et al. 2009a”
- 4225-line 20: I suggest to change the subtitle in “Environmental reconstruction during the late Paleocene”.
- 4225-line 21: Please change in “The Belluno Basin deep-sea environment (Assemblage A)”
- 4226-line6: “Jorissen et al., 1995” is missing in the ref. list. Please add it.
- 4226-line 11: “Fontanier et al 2005” is reported in the ref. list as “Fontanier et al. 2008”. Please correct or add the missing reference.
- 4227-line 4: previously you said the surface waters were “ oligotrophic” and now “oligo-mesotrophic”. What is the correct one?
- 4227-line 9: Please change in “The precursor climate change (Assemblage B)”
- 4228-line 20: I suggest to change in “Climate and marine life during the PETM”
- 4229-line 2: Both the references “Higgs et al, 1994 and van Santvoort et al. 1996” are missing in the ref. list. Please add these references.
- 4229-line 11: I suggest to change in “ The early peak PETM (Assemblages C and D)
- 4229-lines 16 and 19: “Zachos et al. 2005” in the ref. list is indicated as “Zachos et al. 2015”. Please correct/uniform or add.
- 4231-line 16: I suggest to change in “The core of the CIE and Recovery (assemblages E and F)”
- 4235-line 15 “de-oxygenation” this term is not proper. Please replace with “scarce oxygenation” or “sub-oxic conditions”.
- 4237 to 4258 References. The following references are reported in the ref. list but they are missing in the text: Fenero et al, 2012 Hess & Jorissen, 2009 John et al., 2012 Jones & Manning, 1994 Ortiz et al., 2011 Pearson & Thomas, 2015 Sluijs et al., 2009

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Sluijs et al., 2008 Smith et al., 2007 Thomas et al., 1999 Winguth et al., 2010 Zeebe et al., 2009

- 4262 caption of Figure 3. Is F-index from Luciani et al 2010 or 2007 as previously said in the text? Please uniform.
- 4263 caption of Figure 4. Is F-index from Luciani et al 2010 or 2007 as previously said in the text? Please uniform.
- 4264 Caption of Figure 5. Bulimina spp. should group only different species of the genus Bulimina and not other similar genera as Buliminella etc. Please replace Bulimina spp. with “buliminds”.

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