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Climate of the Past Discussions

Interactive comment on "A massive input of coarse-grained siliciclastics in the Pyrenean Basin during the PETM: the missing ingredient of a coeval abrupt change in hydrological regime" *by* V. Pujalte et al.

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The authors, V. Pujalte, J.I. Baseta, and B. Schmitz, present a paper about a coarse-grained siliciclastic deposit from the Pyrenean Basin. The authors relate this deposit to being contemporaneous to the PETM and attribute its occurrence to an abrupt change in the hydrological cycle. Through the stratigraphic investigation of exposed quarries, they make a regional case for a possible drop in sea level pre-PETM followed by a pulse of coarse-siliciclatics during the PETM.

Overall, these authors present an idea that has a lot of potential but is not presented in a scientifically coherent manner. The paper in itself is not well organized and the quality of writing is sub-par, which means this paper needs a lot of work. I recommend extensive revisions but no guarantee of publishing in its current state – reviewing a heavily revised version of this paper is necessary prior to giving the go-ahead to recommend publication.

Key issues: Age model needs to be revised. As of now, it is poorly constrained with just carbon isotope data discussed. Age model discussion and build needs to also include nannofossil data since carbon isotopes alone do not necessitate an age nor confirm stratigraphic position due to circular logic. Although some nannofossil work has been completed (which should not be in the supplement but in the paper), the only relative age constraint is that this coarse siliciclastic unit accumulated sometime between NP7/8 to lower NP10 or from ∼58-54 Ma, not necessarily the PETM. Do authors have independent and/or additional age contraints to legitimately confirm their PETM identification (whether or not coarse siliciclastics are contemporaneous to the PETM – I, an editor, cannot corroborate this at Korres nor Laminoria quarries with current age model)? Additionally, tables must be added to include the raw carbon isotope data they present in Figure 6 (unless this data is from another study?) and to include raw nannofossil data that may or may not be part of this study (unclear based off the writing). Age model would further be strengthened if authors add Zumaia NP10 zonation (part of Figure 7) into age model discussion/build.

Carbon isotope stratigraphy. Since carbon isotopes play a pivotal role in this paper, I recommend authors draft up a figure in which they use carbon isotopes to correlate the Laminoria and Korres quarry sections to other sections in the nearby region that have well-constrained chronostratigraphy (e.g., Zumaia). If done properly, this would allow authors to better pin Laminoria and Korres to global records and PETM by possibly combining figures 6 and 7. As such, I am not convinced this coarse siliciclastic unit is contemporaneous to the PETM, but moreso that it at least accumulated near the

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timing of the PETM. Doing this will strengthen not only the age model build but also age model discussion.

Adding tables not only for age model (discussed above) but also for lithostratigraphy (units A, B, C, D, E, F, G) would strengthen paper.

Introduction section has to be fully redone and built upon. Authors only cite a few regional publications for background purposes even though there is already an extensive literature on this particular subject. Tying these quarries into sequences elsewhere (via citations and additional writing in the introduction) would strengthen this paper and enable authors to build off of already published work. The journal chosen (CP) has global distribution and significance so as a referee, it is absolutely crucial the authors tie this work of theirs to other sections globally, given all the similarities. If authors choose not to do this, then this is not the correct journal of choice for this paper.

Methods section has to be re-written since writing quality poor.

The correct spelling of "Paleogene" is "Paleogene," not "Palaeogene." I did not check the references.

Detailed points to address: Page 2890, Lines 14-17: The only real proof this sequence was derived from the PETM is the stratigraphic position. Isn't the point of the paper to relate a pulse of coarse-grained siliciclastics to having accumulated during the PETM?

Pave 2890, lines 19-20: awkward sentence fragment ". . .turbidites, were accumulated"

Page 2892, lines 19-24: This verbage unclear and other authors have already concluded this. Rewrite: "These authors found that. . ." since it is not these authors that "found" this so add citations to give credit where credit is due. Vegetation point already put out by other studies (See Slotnick et al., 2012 in The Journal of Geology). (although interesting, stating "found" in a paper is a bit strange. Whats the proof? Would be better to rephrase this sentence so that it states what these authors realized in their previous works and cite that work so that readers don't get confused by a broad,

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possibly incorrect statement.)

Page 2893, line 1: “were” awkward.

Page 2893, lines 1-2: don’t use the word “the” when stating shallow setting and deep basin, the authors need to state terms for the setting and deep basin. For example, there were numerous shallow settings during the Paleocene, which one are the authors specifically referring to here?.

Page 2893, lines 2-4: Poorly written. Re-write sentence.

Page 2893, lines 4-5: Awkward verbage. Rephrase so that it is not “it will also be shown that. . .”

Page 2893, line 6: Typo. “Basament” should be “basement,” right?

Page 2893, line 8: awkward. “This paper is mainly based on new. . .”

Page 2893, line 8: “areas” not good word choice.

Page 2893, lines 9-10: Awkward. Re-write entire sentence from “Field data include mapping of these areas and logging and sampling of the P–E interval of selected sections.” To something else. . .

Page 2893, lines 11-12: don’t need to state “laboratory data.” Just state carbon isotopes.

Page 2893, line 12: Awkward sentence fragment. “. . .but a few also from. . .”

Page 2893, line 13: Authors need to keep their writing consistent by either using 13C/12C as ratio analyzed or delta-notation for carbon isotopes throughout. They should not go back and forth between both.

Page 2893, lines 13-18: Run-on sentence.

Page 2893, line 21: Define “negligible.” Authors MUST include the specific instrumental error for accuracy and precision.

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Page 2893, lines 23-26: Both sentences overly verbose.

Page 2893, line 26 to page 2894 line 2: Awkward sentence.

Page 2894 lines 2-7: Sentence overly verbose. Tighten and make more clear to readers since it is difficult to follow in its current state.

Page 2894 lines 8-9: State how abundances quantified and specifically what correction factors used and how.

Page 2894 lines 9: “Stratigraphical not a word.

Page 2894 line 10: “Palaeogene” should be spelled “Paleogene”

Page 2894 lines 11-13: Word better.

Page 2894 line 27 to page 2895 line 1: Awkward phrasing. “. . .also occur, which were mostly accumulated within valleys incised in the inner platform domain. . .”

page 2895 lines 1: Awkward verbage. “. . .Ermua section, is made up variable proportion of carbonate. . .”

page 2895 lines 11-12: Rephrase. Never state clues that offer a correct understanding of the sedimentation processes– what does this mean?

page 2895 lines 15-17: Badly worded sentence. Makes it difficult for reader to follow.

page 2895 lines 19-20: Define and describe each kind of succession or state topic sentence differently.

page 2895 lines 24-25: Never state “..which as a rule. . .” since geology has no rules, just observation and interpretation.

page 2895 line 26: State type of mapping, not just mapping and how/why.

page 2896 line 1: “palaeocurrents” could be spelled “paleocurrents” – would be good to keep palaeo consistently spelled “palaeo-“ or “paleo-“ for all words except “Paleogene”

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(I list all occurrences of this throughout remainder of paper.)

page 2896 line 5: Not necessary to state "…, the valleys being therefore named after them."

page 2896 line 6: Ca. refers to exact age, not width, height, or thickness so remove "…ca.…" from sentence.

page 2896 line 8: "Palaeogene" needs to be spelled "Palaeogene" – this is not the only occurrence of this miss-spelling. In some parts of the paper, authors spell it the correct way but in other parts it is spelled incorrectly. Make sure spelling of "Paleogene" correct and consistent throughout paper.

page 2896 lines 9-10: last part of sentence awkward, that being "…, which prevents establishing whether or not additional valleys existed."

page 2896 line 14: "exemplifies" a poor word choice.

page 2896 line 15: correct spelling of Paleogene.

page 2896 line 16: awkward. "…interval is there represented by deposits of two different depositional sequences eparated by an important discontinuity…"

page 2896 line 18: "…rich in…" bad descriptive term. State numerics of specifics from previous works and cite that work, authors should not make these general statements.

page 2896 line 24: Introduce A and B lithologic units in clearer manner.

page 2896 line 25: Overly verbose. "…is made up of an alternation of …"

page 2896 lines 27: Overly verbose. "…, and it is capped by (to end of sentence on page 2897)…"

page 2897 lines 3-5: Overly verbose and awkward. Re-write!

page 2897 lines 11-12: state page number of Calvet and Julia 1983 ref as well as Jone 2011 ref, not his or her figure number

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page 2897 lines 15-16: Awkward. “Based on that, it is safely to conclude that the . . .”

page 2897 line 19: See my previous comment about the use of “ca.” Remove ca.

page 2898 lines 4-6: Tighten.

page 2898 line 7: spell it “lithologic” not “lithological”

page 2898 line 9: Remove all comments about ‘economic interest’ since this is not a journal about economic geology. Irrelevant to CP! Just state not quarried, no need to explain why.

page 2898 line 10: Overly verbose. “. . .demonstrate that it is up to 7 m thick...” and is there a better reference than just personal communication? Personal communication really should not be used in this case.

page 2898 lines 11-12: what does “its” refer to? Overly verbose again, that being “In its scattered outcrops the unit is mostly composed of red. . .”

page 2898 line 15: change “vary” to “range”

page 2898 line 16: Do not use “They. . .” to start a sentence!

page 2898 line 17: Tighten. “. . .of many of the. . .”

page 2898 lines 19-21: what is main objective? Unclear. Authors state a thickness but verbage unclear. This referee does not see the need to incorporate economic points of the quarry, just complicates paper for readers. Quality glass not at all related to this paper, except to state the presence of quartz (that’s all).

page 2898 lines 21: unclear. “. . .may contain up to...” well, do these samples contain up to 20% or not? State what is in fact correct.

page 2898 lines 22-23: Remove methodology point about separation by sieving and wet spiral concentrators entirely or move to methods section. Out of place at best, unnecessary at worst.

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page 2898 line 25: Awkward. “. . .occur randomly dispersed in the sands. . .”

page 2898 lines 26-27: describe quartzite and quartzarenite occurrences better.

page 2899 lines 11-12: spell “palaeocurrents” as “paleocurrents” (or make sure all occurrences of this consistenly spelled throughout paper)

page 2899 line 19: clarify following sentence fragment “. . .it can be. . .”

page 2899 line 23: As mentioned earlier, authors cannot use term “As a rule” but should state this sentence in a direct way to accurately describe what they are getting at.

page 2899 lines 29-30 (first two lines of section 4.2): Rephrase. Authors should not start age model section by stating “It is now firmly established that the. . .” but instead describe how why this boundary has been constrained to be related to the occurrence of the PETM.

page 2900 lines 1-2: Don’t think authors introduce clastic unit F until this line. If authors want to discuss this unit, introduce the unit earlier in the paper when units A/B/C/D are discussed/introduced or remove.

page 2900 line 3: overly verbose. “..and, consequently, it is reasonable to assume that at least some of them may be coeval to the thermal event.”

page 2900 lines 11-13: authors should also add kaolinite spike in southern atlantic sites (e.g. Site 690), this has been known for 15+ years.

page 2900 lines 19-22: Rewrite. Poorly written.

page 2900 line 10 to page 2901 line 6: See main comment about age model at beginning of this review. The authors have not done their due diligence to confirm the age of the sequence is in fact contemporaneous to the PETM. More specifically, one cannot date sequences from isotopes! Chronostratigraphy is a method applied to sequences with independent age constraints such as magneto and biostratigraphy – this is what

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should be used here. Fig 6 does not include any form of bio/magnetostratigraphy to confirm this sequence is coeval to the PETM. Although fig 11 shows NP10 just above CIE, there is no confirmation of NP9 during CIE which is nanno biozone PETM occurred during. . .in other words this sequence could just as easily reflect another hyperthermal or just so some deposit close to in age to the PETM and not specifically the PETM – additional age constraints are necessary for proper confirmation. Also, incorporate supplemental figure but supplemental figure needs clarification since caption broadly discusses Orio area and not specific outcrops/quarries.

page 2901 line 7: Awkward. "Three additional significant data have been obtained. . ."

page 2901 lines 7-11: Authors list three points, this is not writing, simply a list. Rewrite to make what authors actually trying to get at clear to readership.

page 2901 line 12: ". . .created. . ." terrible word choice.

page 2901 lines 12-13: what evidence do authors have that this is actually the PETM? Lack of age constraints make this assertion largely unconstrained at best, given the late Paleocene and early Eocene was comprised of at least 16 separate CIEs with the PETM just being the most prominent event of them all.

page 2901 line 13: change Title of section. Creation again bad word choice, as mentioned earlier. Formation perhaps?

page 2901 line 15: if widely acknowledge, cite! Or state by whom and which studies.

page 2901 lines 16-17: Writing unclear, separate into second sentence or something but right now poorly written, that being ". . .,the surface of subaerial exposure capping unit B at Korres confirming that scenario." Question: what scenario? Unclear.

page 2901 lines 17-18: Doesn't fit in same paragraph with first sentence. Separate. This is a different point entirely. Section needs better organization.

page 2901 line 19: see prior comment about stating "Field data indicate. . ." and also

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awkward, that being “Field data indicate that the sea-level drop trigering the incision of the. . .”

page 2901 line 19: “trigering” miss-spelled. Should be triggering.

page 2901 lines 19-22: This is an overarching statement not backed by data/info. Why? Whats the reasoning the authors think they have ‘field data’ to substantiate this? Authors need to back up what they say with scientific information, not just state overarching statements like this without specific information.

page 2902 lines 2-4: If none observed, delete sentence. Unnecessary.

page 2902 line 4-6: Tighten. Second half of sentence awkward.

page 2902 line 12: remove word clearly. Unnecessary.

page 2902 lines 10-13: rewrite. Overly verbose.

page 2902 lines 14-16: awkward. Badly written.

page 2902 line 19: overly verbose. “The eventual marine flooding of the valleys is. . .”

page 2902 line 20: see above comments about use of the term “field data”

page 2902 lines 20-22: re-write to clarify what is meant. Hard to follow. Authors need to state what exactly the actual lag in the age model refers to since as of now this is not in their paper.

page 2902 line 29- page 2903 line 2: Do not use word “They. . .” and delete following unnecessary fragment: “. . .the papers resulting from these studies being too numerous to list here. . .” Instead, authors should just choose three-four papers like they have and cite.

page 2903 lines 15-18: Tighten. Should be made two sentences.

page 2903 line 16: “. . .its. . .” bad word choice.

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page 2903 line 17: spell “palaeo-“ of “palaeogeography” consistently through paper as either “palaeo-“ or “paleo-“ for all words except Paleocene

page 2903 line 18: Authors cannot state “. . .sometimes misinterpreted.” If they are not going to cite specific examples of who did what and what was actually misinterpreted and add for reference to readers. Either add citation(s) or remove.

page 2903 lines 24-25: Overly verbose. Tighten. “. . ., but the only interpretation was that. . .”

page 2904 lines 1-2: awkward. Rewrite. “. . .were accumulate at the bottom of an. . .”

page 2904 lines 4-25: This is not scientific writing! It is simply a list full of typos, miss-spelled words, and other issues I have brought up in previous comments. All of this has to be rewritten into a paragraph form suitable for scientific publication.

page 2905 lines 8: “. . .creation. . .” terrible word choice.

page 2905 lines 18-26: Authors keep listing items they want to discuss. This is not good scientific writing. Authors need to fully revise the parts of this paper with lists into well-written scientific paragraphs suitable for publication.

page 2905 line 22: what does “. . .similar to the previous one. . .” mean? Clarify.

page 2905 lines 22-23: clarify. What does “. . .with increasingly important internal hiatuses. . .” mean?

page 2906 line 4: this is the first real discussion of NP10 zone. Move up to much earlier part of paper so that NP10 tied into age model discussion appropriately. As of now, age model discussion nothing more than flawed circular logic with carbon isotope criteria, nothing else.

page 2906 lines 8-10: Bad topic sentence. Rewrite. Authors should not say “. . .hardly surprising that no attempt has been made to pinpoint in them. . .” due to awkward and doesn’t mean anything.

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page 2906 lines 10-11: delete unnecessary sentence.

page 2906 lines 8-17: Another list! Not only is writing sub-par, this is another list. Authors need to remove all lists, as mentioned on numerous occasions and write what it is they want to say to produce scientifically valid writing. Also tighten since overly verbose.

page 2906 line 27 to page 2907 line 9: out of place. All of this should be moved to when Unit B is introduced. Organization of paper poor.

page 2907 line 21: “stratigraphical” not a word

Section 5.2 – general statement. Carbon isotope measurements along is not enough to confirm stratigraphic position. This is circular reasoning. Authors need independent age datums/zones to confirm PETM identification. As of now, this lacks. Authors did mention NP10 biozonation briefly but even this does not necessary mean PETM. If the authors want to use carbon isotope stratigraphy in relation to other sections in the nearby vicinity, then adding a figure showing correlation tie points with other sections would be necessary to do (and incorporate supplemental figure 1), so long as other sections have well defined chronostratigraphy. As of now, this does not exist in this paper and is a big weakness.

page 2907 lines 25-28: out of place. Move to section in which clays are discussed or are the main point. As mentioned previously, organization of paper poor at best.

page 2908 lines 2-7: See above comments about not using lists since this is not scientific writing.

page 2908 lines 8-10: Cite work derived from New Jersey boreholes that have led other researchers to a similar conclusion as well.

page 2908 line 11: Not sure there is enough evidence to support this claim of a sea level fall, which could be due to the difficulty of interpreting this poorly written and badly organized paper.

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page 2908 lines 12-14: Authors did not adequately build their age model so they cannot claim these coarse-grained siliciclastics are necessarily PETM in age, which means this is a false statement. Remove. Authors lack age constraints - they need to build an age model to constrain PETM interpretation, either through adequate carbon isotope stratigraphy and/or bio/magnetostratigraphy. Until then, authors cannot 'assume' these coarse siliciclastics to definitively be coeval to the PETM.

page 2908 line 22 to page 2909 line 6: This line of thought and interpretation is not new. As such, this paragraph should be moved to the introduction as background. Other authors have already integrated the idea an intensified hydrological cycle, particularly enhanced seasonality as a result of warming, may have induced a flux of clastics into shelf/slope settings regardless of basin/location. See Slotnick et al. (2012) in Journal of Geology for a detailed explanation including possible drop in vegetation. The authors also have some papers they can add, that being Schmitz and Pujalte (2003; 2007). Additionally reference previously published climate models and/or IPCC reports that have already dissected this point in great detail (Murphy et al., 2004; Randall et al., 2007; Meehl et al., 2007a, 2007b; Christensen et al., 2007). Modern discharge river data good additional reference for page 2908 line 26 to page 2909 line 1 (Peterson et al., 2002). Other good references for this topic/paragraph include: Ludwig and Probst (1998); Held and Soden (2006); Allan and Soden (2008).

page 2909 line 7: spell "Paleocene" properly, not "Palaeocene"

page 2909 line 13 to page 2910 line 24: If authors revise this paper tremendously, that being they revamp the age model to substantiate these coarse siliciclastics as occurring contemporaneous to the PETM and redo the entire introduction to cite other works, they could then use this paper as a means to build off of previous works. If so, these two paragraphs could then become the basis for an interesting section in the discussion and build off of prior works for a stronger paper with global significance.

page 2910 line 19: spell "Paleogene" properly, not "Palaeogene"

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page 2910 line 25 to page 2911 line 5: This paragraph by itself has a lot of potential to become a strong section in a discussion in of itself. If authors again revise age model to confirm these coarse siliciclastics were contemporaneous to the PETM, then they could build off of previous works regarding the kaolinite source problem across the PETM, that being physical vs chemical. In this case it seems as if they have a good case for physical erosion from older rocks but none of this can be said with any basis unless age model confirms occurring during PETM. Please note comments left by reviewer one for some good papers authors could cite here.

page 2911 lines 7-9: Word better. Rewrite. Overly verbose.

page 2911 lines 9-13: again the authors need to cite the works before this study to give credit where it is due. This is not the first study to consider lower vegetation and enhanced seasonality in relation to a flux in clastics during the PETM.

page 2911 lines 13-14: not sure a lower sea level would necessarily help delivery of bedloads to marine environments. If authors want to relate coarse siliciclastic interval during the PETM body, then they have to think about a potential rise in sea level, not fall beforehand (during the actual thermal event). Reason: thermal expansion of sea water in warmer environments. A fall in sea level, as stated by the authors, would have been before the PETM and not contemporaneous to this depoits, if in fact they are correct with their poorly constrained age model. Regardless, I am not sure they have enough supporting evidence to make this case (not during the event). Conclusion written in an unclear way to tease out whether authors discussing their pre-PETM sea level fall interpretation of contemporaneous PETM coarse siliciclastic accumulation.

page 2911 line 25: verbose word fillers not necessary. Authors need to tighten writing. "Based on an entirely different set of data from the. . ." that being authors can say as much and in a clearer manner in less words.

Figure Captions: Fig 1: Spell "Paleogene" correctly. For and "paleogeography" see previous comments. Awkward part: ". . .source areas, respectively supplying. . ."

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Fig 2: (a) spell “Paleogene” correctly.

Fig 3: change spelling of “lithological” to “lithologic”

Fog: please add scale bars. Although some of the photos include rock hammers, scale bar for each image is necessary.

Fig 5: correct spelling of “Abandonned” to “Abandoned. Please add scale bars to each photo (except for B and C which already have scale bars).

Fig 6: As stated above, this is not clear. Korres stratigraphic section should be next to Korres section data – revise figure accordingly. In addition, I recommend an overall-encompassing figure in which authors correlate Laminoria and Korres sections to another section with good chronostratigraphic control such as Zumaia so that age model can be strengthened.

Fig 7: “Explanation within the text.” statement unnecessary.

Fig 8: Add scale bars to each photo.

Fig 9: Spell “Paleogene” properly. As of now, it is spelled “Palaeogene.” “Explanation within the text.” statement unnecessary.

Fig 10: Add scale bars to each photo.

Fig 11: Change “. . .studies. . .” to something more clear.

Fig 12: includes awkward writing, that being “. . .were accumulated within the incised valleys,. . .” In fact, the sentence this is in should be broken into two. Part b. tighten, not well written (long run-on).

Sincerely, Benjamin S. Slotnick BP PLC

Interactive comment on Clim. Past Discuss., 11, 2889, 2015.