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Open Access Earth System Science Data Discussions

Interactive comment on "Compilation of pollen productivity estimates and a taxonomically harmonised PPE dataset from Northern Hemisphere extratropics" *by* Mareike Wieczorek and Ulrike Herzschuh

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Author Response

We thank both reviewers for their helpful and constructive suggestions. From our answers you can see that we are ready to revise the dataset and adjust the manuscript.

Anonymous Referee

1.1 Synthesis of relative pollen productivity estimates (RPP) is useful to achieve pollen-

based quantitative reconstructions of plant cover for the purpose of palaeoenvironmental and -climate studies taking plant cover into consideration. RPP is one of the most important parameters in the models of quantitative vegetation reconstruction (e.g. REVEALS and LOVE model, Sugita, 2007a and b). The reliability of RPP determines the reliability of the vegetation reconstruction. Therefore, it is important to check the theory and methodology behind each original publication to include only reliable pollen productivity before calculating a mean of such values. My major concern of this study is that it does not take into consideration of earlier evaluation of RPPs (Mazier et al., 2012 for Europe; Li et al., 2018 for temperate China), which is not good for the reliability of future quantitative reconstruction if the unreliable RPP values are used. My second concern is, so far there is no test about whether the RPPs of one continent are reliable for application in quantitative reconstruction of another continent available so far, so it is better to handle them separately. With the reasons mentioned above, I would recommend a major revision.

1.2 We thank the anonymous referee for the critical and very constructive review, giving precise advises to create a better dataset. When preparing a revised manuscript we would be happy to acknowledge you by name.

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2.1 I suggest following revising strategy: 1. List all available relative pollen productivity estimates, indicate the ones that evaluated by experts or tested for reliability in the original publication.

2.2 We gratefully thank the anonymous referee for this suggestion. In the process of revision, we will follow this advice, by compiling a dataset with all available RPP-values, indicating within the dataset whether a study/RPP value was evaluated by the original authors or by other experts (especially taking into account evaluations of Li et al. 2018 and Mazier et al. 2012).

—

3.1 2. Check the reliability of each study through following steps: 2.1 There are several assumptions behind the ERV model, the reliability of the RPP values depend on whether the assumptions of the ERV model in the study are meet, check each study and keep the ones meet the assumptions.

3.2 For a revised version, we will collect the main assumptions (increasing log-likelihood + SE>RPP) and indicate for each study, whether they are met.

—

4.1 2.2 In theory, log-likelihood will increase as the distance from sampling site increases and gradually reach an asymptote at the distance of relevant source area of pollen (RSAP). Check and keep only the studies with theoretically correct log-likelihood against distance curve.

4.2 We will follow this advice.

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5.1 2.3 Check the SE and RPP, retain the ones that SE<RPP

5.2 As described in lines 56, we retained only those which meet this condition ("Afterwards, all PPEs with SD>PPE and non-plausible PPEs >50 were excluded from the dataset").

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6.1 2.4 The RPPs from different continents can be very different mainly due to different plant species involved for same pollen type. Test of the reliability of sharing the RPPs among continents with observations (e.g. Hellman et al., 2008, Journal of Quaternary Science) or historical vegetation maps (Cui et al., 2014, Ecology and Evolution) is very important, but will be very time consuming and difficult to collect such data, therefore no such tests available so far. It is therefore important to prepare the RPP dataset of each continent separately for this study.

6.2 We acknowledge your concerns regarding the taxonomically harmonised RPP dataset over all continents. We will conduct further statistical analyses on the variability of RPP values within and between continents. We plan to present the RPP continent-wise, depending to the analyses results, we will present in addition also the hemisphere-wide results. We consider the presented averaged RPP values not as a tool for site-specific coverage reconstruction but rather as a tool for data transformation to be applied to large-scale pollen data sets.

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7.1 2.5 Calculate the mean of the retain values from above and do box plot of the PPE-means by excluding values defined as values outside the range of $\pm$1.5 interquartile range for each continent separately

7.2 Please see our answer 6.2.

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8.1 3. It is important to warn the readers the importance of using only the reliable RPPs

8.2. Please see our answer 2.2 and 3.2. We will indicate the reliability of the RPP values and will warn readers to only use these, as you suggest.

—

9.1 4. In the dataset file, please do not mix the ERV sub-models and dispersion functions, they are totaly different things. Please indicate the distance weighting method of each study.

9.2 When going again through each study, we will follow your recommendation.

—

10.1 To achieve the goal of a more constructive and useful dataset of this synthesis for future application in quantitative reconstruction, I would recommend a second review

of revised version by experts in ERV model and quantitative vegetation reconstruction models.

10.2 We hope we will get the chance to upload a completely revised dataset and manuscript and will be happy to receive further recommendations.

Marie-Jose Gaillard (Referee)

General comments

1.1 This compilation is useful as a summary of the studies that have attempted to estimate pollen productivity of plant taxa with the aim to apply models of pollen-vegetation relationships such as REVEALS and LOVE (Sugita et al. 2007a and b, The Holocene). However, the way in which the values of relative pollen productivity (RPP, earlier abbreviated PPEs) found in these publications have been handled is neither adequate nor useful. My major concern with this synthesis is that it handle RPPs as they were measurements, but they are estimates calculated using a model (ERV model) that has assumptions. When these assumptions are badly met in the studies, the results do not make sense. Unfortunately several RPP studies were published although they are theoretically not sound. This is due to the fact that few palynologists understand the theory of the ERV model, its sub-models (1,2,3), and the likelihood method used to estimate RPPs. Therefore reviewers did not notice that these studies present values of RPP that are not correct. The compilation of M. Wieczorek and U. Herzschuh does not take into account earlier expert evaluations of the RPP estimates (e.g. Mazier et al., 2014 for Europe; Li et al., 2018 for China). It therefore disregards careful evaluations that were meant to help palynologists in their choice of values to be applied. It implies that the database includes a mix of reliable and unreliable values of pollen productivity. The database also excludes reliable values for plant taxa that have been harmonized into higher taxonomic groups and, therefore, mixed with values representing a larger number of species or genus and often different ones. Moreover, the different ERV sub-models used are not explained, and the reason why the results from all ERV sub-

models are not included in the database is not provided. In the excel file that can be uploaded in PANGAEA, the column “model” includes a mix of information on the ERV model submodels (1, 2, 3) and on models of dispersion and deposition (e.g. Langrarian model), although these are two difference things. There should be one column for the ERV sub-model chosen by the authors of the original publication (1, 2 or 3), one column for the dispersion and deposition model (Gaussian Plume Model or Lagrangian model), and a third column for the vegetation distance weighting model (1/d or Prentice’s model (bog)). In my opinion, a database should either include all RPP values published (i.e. values obtained with all ERV sub-models and all distance-weighting methods used by the authors) OR a selection of RPP values based on a proper expert evaluation. The database as it stands is neither nor. If it is a database including all values, the user should be referred to former evaluations and warned on not using the database as a “black box”, but as a source of data for further evaluation and testing of the values. If it is a database including only part of the published values, the reason for including and excluding values need to be argued for on scientific/theoretical grounds. I am of course fully open to new and different evaluations from those by Mazier et al. (2012) and Li et al. (2018). However, these evaluations should be based on expert knowledge, which is not the case in the current compilation submitted to ESSD. The database is now including values from studies that are theoretically not sound because most of the assumptions of the ERV model are not met. For instance, Li et al 2011 and Han et al. 2017 (included in the compilation) are theoretically not sound studies (see evaluation in Li et al., 2018). In contrast, Zhang et al. 2017 (not included in the compilation) is a study performed following the correct standards and that meets the most important assumptions of the ERV model (see evaluation in Li et al., 2018). The same can be said of several European studies that are either included or excluded without relevant reasons. It should be also noted that there is a new synthesis and evaluation of RPPs in Europe soon to be submitted (Gaillard et al., in progress), and a synthesis and evaluation of RPPs in N America-Canada-Alaska (Dawson et al. in progress). These studies will further help palynologists to choose RPP values for applications in those

regions. I do not want to reject this paper, because it would not be constructive. I require instead, for the sake of high quality science, that the revisions I am suggesting be considered with care. In order to be useful for the scientific community, the database should include all published RPP values. The authors then have to warn the users on the importance of choosing their RPP values after thorough evaluation of the RPP studies, considering the aim of their application (reconstruction of local, regional, or continental vegetation cover), and having strong arguments for their choice. One has to remember that most published RPP values have not been tested/validated. There is therefore an enormous need of test/validation studies using various alternatives of RPP values (see validations in Hellman et al., 2018 a and b; Cui et al., 2014; Mazier et al., 2015). For the sake of such studies, a complete database of RPP values would be most valuable.

1.2 Thank you very much for your honest and detailed revision of our dataset and manuscript. As described in our answers to the Anonymous Referee, we will compile a dataset containing all available RPP values. We will indicate which studies/values have been evaluated by the original authors or by other experts (especially taking into account evaluations of Li et al. 2018 and Mazier et al. 2012). We will furthermore collect the main assumptions of the ERV model (increasing log-likelihood + SE>RPP) and indicate, whether they are met.

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2.1 There is, however, one part of the paper that cannot be accepted: the “harmonized RPP dataset” of means of RPPs throughout the northern hemisphere. There are some limits to mixing the RPP values over geographical space!. When there are strong reasons to think that differences between obtained RPPs are due to differences in comment species represented in different continents (such as for Artemisia and Pinus in China versus in Europe/N America), it does not make sense to use a mean of those values in all parts of the Northern hemisphere. If we have used a mean of values within NW Europe (Trondman et al., 2015) and within temperate China (Li et al., 2020),

it was motivated by the fact that there were too little RPP values to demonstrate that the difference between RPPs within Europe (or within China) could be explained by climate and/or vegetation composition alone. However, it is clear that the RPP values of e.g. Pinus and Artemisia are generally higher in temperate China than in NW Europe (based on the theoretically soundest studies). Therefore, it is not appropriate to mix them.

2.2 We acknowledge your concerns regarding the harmonised RPP dataset of means of RPPs throughout the northern hemisphere. Please also see our answer 6.2 to the anonymous referee. For a revised version, we will conduct tests on the variability of (reliable) RPPs within and between continents. Depending on the results, we will reconsider to calculate mean RPPs per continent or for the entire Northern Hemisphere.

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3.1 In summary, I request the following major revisions: 1. Delete the “harmonized RPP dataset” with mean RPP values for the entire N Hemisphere, it does not make sense, as long as it is not tested/validated to produce realistic REVEALS reconstructions of land cover. The danger is to let people believe that this RPP dataset is the best possible for the N Hemisphere and can be used right away for the best possible results. This neither true nor tested.

3.2 Please see our answer above (2.2): Depending on the results of variation within and between continents, we will decide on how to proceed with the harmonised RPP dataset. In either way, we will warn the reader to not use the dataset without further own assessments of the suitability of the dataset for the respective study.

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4.1 2. Add to the database all RPP values available in all RPP studies that are not included so far.

4.2 We will follow this advice and provide such a table, to give a most complete

overview on all data available.

—

5.1 3. Indicate in the database the studies and RPP values that were evaluated as not reliable due to theoretical problems (often assumptions of ERV model not met, and/or strange behaviour of log likelihood values while estimating RPP values) in earlier expert evaluations.

5.2 Please see our answer to your comment 1.1: In a revised version, we will compile and present all RPP values. We will indicate which studies/values have been evaluated and whether the main assumptions of the ERV model are met.

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6.1 4. Warn the user: the database should not be used as a “black box”. Values should be selected carefully based on sound arguments.

6.2 We will follow this recommendation.

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Specific comments

7.1 Line 10: “Pollen productivity estimates (PPEs)” Please use the more useful term Relative Pollen Productivity (RPP) estimates (or RPPs) that is now more commonly used than PPEs in order to avoid any misunderstanding

7.2 Thank you for this advice, which we will follow in our revision.

—

8.1 Line 14-15: This compilation allows scientists to identify the best PPE for their own studies and to identify data-gaps in need of further PPE analyses. This sounds good; but HOW will scientists identify the "best" PPEs??? How will they evaluate all these values?? See my more detailed separate comments about this

8.2 In the revised version, we will include all RPP-values of the original studies. The - to the best of our knowledge - most complete overview of studies and their data can help scientists to identify RPP studies in their region, which can be applied to their data. We will point out in more detail, that before using these data, the original publications need to be read in detail for final decisions.

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9.1 Line 28-19: , pollen productivity estimates (PPE) and their fall speeds have been calculated for various regions and taxa revise sentence; ".... relative pollen productivity (RPP) have been estimated and fall speed of pollen (FSP) measured or calculated for major plant taxa in several regions of the world.

9.2 We will follow this suggestion.

—

10.1 Line 32: Mazier 2008 Mazier 2012

10.2 Thank you, will be changed accordingly.

—

11.1 Line 34-36: an easy-to-apply unified PPE dataset for Northern Hemispheric pollen would help to reduce the bias of pollen dispersal and pollen productivities in vegetation reconstructions using broad-scale pollen datasets by adopting a consistent approach. It sounds nice, but I do not see how you can get a single RPP dataset for the entire NHemisphere given that there are obvious differences in RPP for plant taxa (such as Pinus, Artemisia, Chenopodiaceae) between e.g. Europe and China. Using a mean value for such taxa does not make sense; see my more detailed separate comment

11.2 Please see our explanation above (reply 2.2 and 3.2 to your review and reply 6.2 to the anonymous referee). The taxonomically harmonised, northern hemispheric dataset should mainly be applied to pollen datasets over large scale regions. Available

studies on pollen productivity are available in a rather clustered format in some regions of the world, but largely missing in others. We will check for pollen-variability within a continent and between continents, to finally decide whether a northern hemispheric dataset will be kept or if three datasets (Europe, Asia, North America) will be presented.

—

12.1 Line 37: PPE and fall speed Reword: "... a unified dataset of RPP estimates and FSPs for major Northern Hemispheric plant taxa.". Note however that I reject the concept of a single RPP and FSP dataset for entire NH

12.2 We respect your position concerning the single dataset, but believe that there are areas of application where it is relevant. These areas of application comprise, as described above, mainly large scale applications to big data sets. Please also see our other replies (e.g. 11.2).

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13.1 Line 44: profound overview reword: ... to gain the most complete overview possible of ....

13.2 Will be changed accordingly.

—

14.1 Line 46: correction factor Don't use this term. A correction factor is another concept and is known in the literature mainly from the correction factors of S.T. Andersen. These were used to roughly correct pollen %. They were not proper RPP (PPE), and were not used together with models

14.1 Thank you for clarifying this. We will reword the manuscript based on your remark.

—

15.1 Line 47: provide such fractionate correction factors What is meant here?

15.2 This is meant for example for publications investigating pollen productivity but providing e.g. count data instead of RPPs. Will be rephrased to: 15.3 Publications which did not provide RPPs or consisted only of compilations of previously available PPE data were excluded from all further analyses.

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16.1 Line 50: The review of Li et al. (2018) does not contain newly calculated PPE It is a shame that you ignore the careful work made in Mazier et al. 2012 and Li et al. 2018 to select the most reliable RPP values on the basis of the method used and thorough evaluation of the values. RPP studies using the ERV model are not straight forward to conduct, and some of the values published are not reliable at all because the authors have made theoretical errors in their use of the ERV model. Moreover, most of the RPP published have not been tested/validated

16.2 Please see our above replies to your review (1.1 and 5.2).

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17.1 Line 51: which of we incorporated Reword: "....from which we selected only those published in Chinese."

17.2 Will be changed accordingly.

—

18.1 Line 54: In a first step, all PPE values and, if given, their standard deviation (SD) Does this mean that you included RPP values that did not have SDs? Why? Do you think it is a good idea to use RPP without SDs? It will provide an error on the REVEALS or LOVE reconstructions that will be misleading.

18.2 We will largely remove RPPs without SD. However, we consider e.g. Larix, of which the only available RPP based on Poaceae is given without SD, as an indispensable taxon. In the revised version we will point to this problematic taxa and indicate the

knowledge gap.

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19.1 Line 56-57: a reasonable taxonomic harmonisation It might be reasonable in terms of plant taxanomy, but it might not be reasonable in terms of RPPs, i.e. you might mix species with totally different RPP values, and species that do not exist together on a particular continent.

19.2 As stated above, we will test for the variability within and between continents to decide whether we keep the up with our concept or only present different RPPs for each continent. As well, we consider the presented RPPs more as a tool for pollen-data transformation rather than for site-specific quantitative vegetation cover reconstruction. We will better indicate this in the improved version of the manuscript.

—

20.1 Line 61: we confined our analysis to publications with Poaceae as the reference taxon. such publications according to what you are saying below! My initial comment was: Why? It is possible to convert RPP relative to other taxa (Pinus or Quercus for instance) into RPP relative to Poaceae, at least if the authors have calculated a RPP for Poaceae as well. It would be useful to indicate what studies you excluded on this basis.

20.2 The information of which studies we excluded is given in Figure 1 and in lines 74 to 77 of the manuscript.

—

21.1 Line 62: boxplots of PPE per taxon were calculated with the help of R (version 3.5.3, R Core Team, 2019). Please motivate/argue for the choice of this particular method.

21.2 Boxplots calculate the quartiles of data. Defining values outside the of $\pm$1.5 *

interquartile-range (range between the 0.25 and 0.75 quartile) is a common approach for outlier identification.

—

22.1 Line 64-65: excluding outliers (defined as values outside the range of $\pm$1.5 * interquartile-range). Could you please motivate/argue for the choice of this criteria to define outliers

22.2 Please see our explanation above.

—

23.1 Line 65: delta method (Stuart and Ord, 1994). Add: (...., 1994; see Li et al., 2020 for details on the method).

23.2 We will add this reference.

—

24.1 Line 65-68: Subsequently, we looked at those taxa for which PPEs are available but do not have Poaceae as the reference taxon. These comprise Eleaganaceae, Nitraria, Tsuga, wild herbs and PoaceaeCrop. For studies that included Poaceae in the analysis set, we set Poaceae as 1 and recalculated the other PPEs based on that ratio This comes too late! See my comment above. From your text above it seems you excluded those studies with other taxa than Poaceae as reference taxon.... Restructure the paragraph! - Other comment: "wild herbs" does not help us so much if we do not know what they include!

24.2 Wild herbs will be checked again for included taxa. The paragraph will be restructured as follows: 24.3 Line 59 and following: Some publications did not use Poaceae as the reference taxon: while it is possible to recalculate values relative to Poaceae (cf. Li et al., 2018; Mazier et al., 2012), we confined our analysis to publications with Poaceae as the reference taxon. However, some taxa are not available with Poaceae

as reference – for these, recalculations were conducted.

—

25.1 Line 67: PoaceaeCrop I guess this is "Cerealia type"? Why not call it cereals?

25.2 Will be changed accordingly.

—

26.1 Line 68: (applies to. . .) What do you mean? "following (or according to) Sugita et al....."?

26.2 This means that the recalculation based on available Poaceae RPP could only be applied to this study. Will be changed to: 26.3 For studies that included Poaceae in the analysis set, we set Poaceae as 1 and recalculated the other RPPs based on that ratio (was the case for RPPs of Sugita et al., 1999).

—

27.1 Line 69-72: For all other studies (Calcote, 1995; Chaput and Gajewski, 2018; Li et al., 2015; Matthias et al., 2012; Theuerkauf et al., 2015), we recalculated the PPEs based on the original reference taxon. If, for example, Acer was used as the reference taxon, we assumed the Poaceae-to-Acer PPE to be the same as our calculated mean PPE for Acer and recalculated the other values based on that ratio Same comment as above. And, add a reference for this way to recalculate RPPs (I think Mazier et al., 2012 was one of the first using this approach).

27.2 We are not sure which of the above comments is meant. The reference to this way of recalculation is given in line 60/61 but will be added here as well.

—

28.1 Line 74-75: Publications are not considered if neither Poaceae was used as a reference nor species included for which no PPE would be available without recalculation

Whar do you mean? This sentence does not make sense! Rewrite!

28.2 This means, that studies are not included if (i) they do not have Poaceae as reference taxon and (ii) include only taxa of which we have RPP values based on Poaceae from other studies and will be rephrased (28.3). However, the whole paragraph might change after new analysis and evaluation of ERV in the different studies (see replies 1.2 to your review and 3.2 to the anonymous referee). 28.3 Nine studies (Andersen, 1967; Bunting et al., 2005; He et al., 2016; Li et al., 2015; Sjögren et al., 2008b; Theuerkauf et al., 2013; Twiddle et al., 2012; Wu et al., 2013; Zhang et al., 2017 (Changbai Mountains)) are excluded from the as they did not use Poaceae as reference taxon and include only taxa of which RPP values based on Poaceae are available in studies

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29.1 Line 68-92: Changbai site from Zhang et al. (2017) were excluded from calculations because Poaceae was not the reference taxon. Eight studies did not have Poaceae as the reference, but did include PPE values for taxa which would otherwise not be represented in the final PPE-dataset (applies to Calcote, 1995; Filipova-Marinova et al., 2010; Li et al., 2011; Matthias et al., 2012; Sugita et al., 1999, 2006; Theuerkauf et al., 2015; Zhang et al., 2017 (site Taiyue)). These taxa are Aesculus, Elaeagnaceae, Nitraria, PoaceaeCrop, Pterocrya, Tsuga and wild.herbs (Table 3). The final dataset consists of PPE values for 58 taxa and fall speeds for 57 taxa, with 54 taxa having both PPE values and fall speeds available (Table 3). This is already said in Methods. I would recommend to have this only in Methods and to explain this better. It is very confusing as it is written now. AS far as I understand you have 3 categories of studies with reference taxa different than Poaceae: a) reference taxon different than Poaceae, but RPP for Poaceae available: conversion is simple; b) reference taxon different than Poaceae, and RPP for Poaceae not available: conversion requires assumption "we recalculated the PPEs based on the original reference taxon. If, for example, Acer was used as the reference taxon, we assumed the Poaceae-to-Acer PPE to be the same as our calculated mean PPE for Acer and recalculated the other

values based on that ratio"; c) reference taxon different than Poaceae, and xxxxxx (I don't understand what is characteristic for this third group): conversion is not possible if we want to use the same assumption/approach as for b). Once these 3 groups are well defined, make a Table with the studies and taxa that are related to those 3 groups.

29.2 We have the following four criteria, which we will move into the Methods for better description: 1) Poaceae is the reference taxon 2) another species is the reference, but a value for Poaceae available → recalculation for those taxa, of which we do not have an RPP-value with Poaceae as original reference taxon 3) another species is the reference and no value for Poaceae available → recalculation for those taxa, of which we do not have an RPP-value with Poaceae as original reference taxon 4) only values already recalculated to Poaceae as reference taxon available → no own recalculation, but inclusion only of those taxa of which we do not have an RPP-value with Poaceae as original reference taxon.

—

30.1 Line 98: as well as subtropical regions are largely lacking Did you include the subtropics in your search of literature? Seems to me that some studies are lacking in that case. There are at least studies in press. If you want to include the subtropics in this study/paper you should tell what is in progress as well.

30.2 We conducted an open-ended search (see search terms in lines 42-44), which resulted in the literature given in Table 1.

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31.1 Line 100: can be Has been

31.2 Will be changed accordingly.

—

32.1 Line 101: broad scale what do you mean? A large number? Or values from

different parts of the world, or both? Clarify!

32.2 Large number. Will be changed accordingly.

—

31.1 Line 105: show Shows

31.2 Will be changed accordingly.

—

32.1 Line 105-106: While Cyperaceae or Fraxinus Alnus, Quercus and Chenopodiaceae would be better examples. Low values have a tendency to "look" more similar than large values, but you should think about what a RPP is used for. A RPP of 2 is very different than a RPP of 1, even if it does not look to be very different. It means that one of the value is double the other. A RPP of 10 seems much different than a RPP of 20, but in fact it's the same difference, one is double the other. The difference it will imply in the application of these values in reconstructions will be the same in both cases.

33.1 We will reconsider our examples based on your remarks.

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33.1 Line 106: similar range Do you mean? similar values?

33.2 Yes.

—

34.1 Line 106-107: strongly vary between the publications In fact it is mainly a large difference between Europe and China for Artemisia, Betula and Pinus, as discussed in Li et al. 2018

34.2 As described above, we will compare in detail the variability within and between continents and present the results and implications here.

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35.1 Line 115-119: such as vegetation characteristics, and some uncertainty due to the use of inconsistent reference taxa. Most studies used Poaceae, a widespread family, whose pollen is easy to identify and often preserved in a good state. However, as discussed by Broström et al. (2008), the pollen cannot be identified to species level and different studies may thus have used different species of Poaceae for the reference. Other taxa such as Quercus or Acer are therefore sometimes used as the reference taxon These explanations are the general ones that have been discussed in all syntheses so far. However, for Artemisia and Pinus in particular, Li et al. (2018) have discussed the differences within China with more specific arguments. Please revise accordingly.

35.2 We will provide more examples including Li et al (2018) how previews authors dealt with this problem.

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36.1 Line 124-125: This open access dataset can be used to improve our understanding of past vegetation dynamics for a broad range of taxa rather than interpreting pollen counts or percentages alone. This is perhaps my most serious concern about this paper. If the dataset made open access in PANGAEA is used as a "black box" in will really NOT improve our understanding of past vegetation cover. It may provide results that are nonsense. Please read my detailed separate comment about this, and revise accordingly.

36.2 We assumed with our revised manuscript including all the detailed suggestions from both reviewers our data set does not come as a “black box”. Please also read our replies above. We will reanalyse the data to decide on how to proceed with the taxonomically harmonised dataset. Furthermore, we will warn the reader to not use the dataset without further own assessments on the suitability for the planned application.

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37.1 Line 127: The compilation is useful for the identification of available PPE sets at specific sites and regions. Yes. But I don’t think it adds so terribly much to the syntheses of Li et al. 2018 and Mazier et al. (2012). There are moreover syntheses in progress for northern America (Dawson et al., personal communication) and a new one for Europe (Gaillard et al.).

37.2 Thank you very much for this information. However, we cannot take a position on these syntheses as they have not yet been published. We acknowledge the work, Mazier et al. and Li et al. put in their compilations. However, new studies have been published since then and furthermore, both do not include the studies in Northern Asian and North America. We consider our study mainly as providing a basic and most complete overview on data access of RPP studies and are convinced, that a complete compilation is of value for the scientific community.

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38.1 Line 129-130: The unified PPE dataset of Northern Hemispheric extratropical taxa allows a consistent approach to be applied to synthesised pollen data at a continental to hemispherical scale Not the best way to do it, the values need to be evaluated!

39.2 As described above we will add some evaluation in particular with respect to regional differences.

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40.1 Line 132-133: and PPEs from a nearby local study would not necessarily be best suited for their interpretation. Please develop what you mean here. It is true that one can think of using RPPs from particular modern climate zones for time periods of the past with similar climate conditions at other geographical locations than today. However, doing so imply that we first can demonstrate that differences in RPP between studies are indeed due to climatic parameters. It is certainly useful to have all these

values in a database. BUT, all scientists that will use them will HAVE TO go back to the original publications to evaluate the values. Anybody can do alternative syntheses to those already published by Mazier et al 2012 or Li et al 2018. But what is MOST needed to day is VALIDATION of these values.

40.2 An in-depth assessment is out of the scope of our manuscript, which focuses on the provision of (to the best of our knowledge) all available RPP studies in the northern hemisphere. We will however provide further information on whether the data were evaluated by the original authors or other experts, with main focus on Mazier et al 2012 and Li et al 2018.

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41.1 Line 146-147: This study is a contribution to the Past Global Changes (PAGES) LandCover6k working group project. It won't be accepted as a contribution to LandCover6k if relevant revisions are not implemented. This study has not been discussed with any of the responsible coordinators of PAGES LandCover6k. PAGES LandCover6k has a certain number of quality requirements for the studies that are performed as contributions. We can of course use different methods and have other ideas in terms of interpretation of results. But we can't accept scientific/theoretical mistakes as it is the case here.

41.2 We hope that an overview of all available RPP data that comes along with a thoroughly revised manuscript according to your and the anonymous reviewer constructive suggestion will be considered as an contribution to PAGES LandCover6k. We also specifically submitted this data to ESSD, as we know that the entire community can join the revision of data and manuscript.

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42.1 Table 1: Broström et al., 2008, Mazier et al., 2012 Would be useful to know from the table that this is a review

42.2 The information will be added.

—

43.1 Table 2: Taxon Are these thought as pollen morphological taxa? In that case, specify! It is not the same as plant taxa

43.2 Yes, these are pollen morphological taxa. The information will be added.

—

44.1 Table 2: Original Taxa Here again you should specify that these are the pollen-morphological taxa for which RPP were estimated in the literature; for some of these taxa it is not relevant to have lost the information on RPP for particular species or genus in the case of such a synthesis. To group pollen-morphological types is sometimes needed if those taxa were not identified in the fossil pollen records used for reconstruction. But in other cases these RPPs can be used. I am thinking of e.g. Compositae SF Cichoriodae, Aster T. /Anthemis T, Calluna vulgaris, Pinus cembra, Secale cerealia, Trollius europaeus, Filipendula, Potentilla type, different Plantago species, P. lanceolata in particular, etc.

44.2 The grouping presented in Table 2 is particularly important for the harmonised data set. Since we do not think that the northern hemispheric RPP-dataset will be applied for site-specific, but for large, taxonomically harmonised datasets, we regard the groups as useful taxonomic units. We will however check again our groups with regard to the proposed taxa.

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45.1 Table 2: Aster-Anthemis type italic and write Aster/Anthemis type

45.2 Will be changed accordingly.

—

46.1 Table 2: Leucanthemum vulgate vulgare?

46.2 Yes, will be changed accordingly.

—

47.1 Table 2: Robinia Sophora write Robinia/Sophora

47.2 Will be changed accordingly.

—

48.1 Table 2: Cercis italic!

48.2 Will be changed accordingly.

—

49.1 Table 2: Lamiaceae + Mentha type Thymus + Thymus praecox + Vitex negundo very different pollen-morphological type; can't be harmonized in this way

49.2 Please see our answer 44.2 – we will reconsider the grouping of pollen-morphological types.

—

50.1 Table 2 : Mentha type Thymus + Thymus +

50.2 Will be changed to Mentha type (Thymus).

—

51.1 Table 2: PoaceaeCrop In the table of mean RPPs you have also cereals, what is the difference between PoaceaeCrop and Cereals?

51.2 PoaceaeCrop and Cerealia will be combined.

—

52.1 Table 3: Have genus names in italic

52.2 Will be changed accordingly.

—

53.1 Table 3: PoaceaeCrop Are these wild Poaceae that are cultivated? Or Cerealia type? Isn't it a "synonym" for "Cerealia"? What is this taxon good for?

53.2 PoaceaeCrop and Cerealia will be combined.

—

54.1 Table 3: wild herbs What wild herbs? What is this taxon good for if we do not know what plant taxa it includes?

54.2 Wild herbs will be checked again for included taxa.

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55.1 Figure 1: What means the asterix? What is (from Gaillard 1994)? What publication is it? Not in the list of publication. And why? What is wrong with Sugita et al. 1999 as reference in this case?

55.2 We are not sure which asterisk is meant. Some references have a ° indicating that they are extracted from Li et al. 2018, as stated in the figure caption. We used Sugita et al. 1999, who stated to have their data from Gaillard et al. 1994 – the reference will be added to the list of publications.

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56.1 Figure 2: which replace by "that"

56.2 Will be changed accordingly.

—

57.1 Figure 3: values Add SEs for all values!!!!

57.2 Will be added.

—

58.1 Figure 3: species Taxa

58.2 Will be changed accordingly.

—

59.1 Figure 3: upper panel Would be good to also add the grey mean in the upper panel

59.2 Will be added.

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60.1 Figure 3: lower panel Specify that the grey bars are acoording to "this paper, mean values"!

60.2 We will indicate, that the values in the lower panel are means.

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61.1 Figure 3: showing similar values for some and a high variability for other taxa. delete; not relevant in a Figure caption

61.2 Will be removed.

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2019-242, 2020.