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Interactive comment on “Environmental factors controlling lake diatom communities: a meta-analysis of published data” by S. Blanco

Anonymous Referee #1

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This paper presents a meta-analysis of the relation between diatoms and environmental factors by combining results obtained in previous paleolimnological research programs. Although this topic is indeed interesting from a macroecological point of view to study for example the effect of different variables on diatom communities along latitudinal or altitudinal gradients, I have serious doubts on the adopted approach, which is in my opinion biased in two ways. First, a lot of existing datasets were not included in the analysis. During the past decades quite some calibration datasets were developed for tropical regions and those at the high latitudes of the southern hemisphere (examples listed below). Second, the datasets included were generally aimed at developing transfer functions to reconstruct pH or trophic state (TP). This is evidently linked with the two major problems limnologist had to deal with the past decades, namely eutrophication and acidification. Hence, pH and TP often explain a high amount of the

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variation in the diatom community structure in these datasets because the pH and TP gradients were intentionally wide. It follows that assessing for example the importance of pH along latitudinal gradient is biased. For example, if lakes sensitive to changes in pH are situated at higher latitudes because non-calcareous rocks are abundant in these regions, this will affect the outcome of the meta-analysis. Instead, if one aims to assess the importance of different factors on diatom communities, datasets spanning the natural gradients should be used and not those developed to study a particular lake type/limnological problem.

A second yet also major concern is related to the lack of a clear aim or working hypothesis. Why is it important to study the effect of different variables along geographic and climatic gradients? What is the rationale behind this? Moreover the paper not really adds new insights to the existing knowledge.

The language should be checked by a native speaker and each statement should be double checked for its relevance and correctness. Some of the statements were for example erroneously cited (see details below).

Page 15890 L.2: change 'play a key role in the development of' to 'are widely used to develop' L.10: change 'that show' to 'which enable to reveal' L.14: 'physiographical' should be 'geographical'? L.15: entire abstract should be in past tense L.16: lake depth is a physical limnological variable, not a physiographical one L.18-21: unsure what is meant with this sentence The abstract is too vague; I don't see the point the author wants to make and I suggest to summarize the main findings instead of providing the reader with general information

Introduction L.23-24: is there another approach than paleolimnology for reconstructing past environmental changes in lakes? L.25: delete faithfully Page 15891 L.2: change 'developed' to 'used' L.9: for the reconstruction L.9-10: ', which can be applied to investigations of recent' should be 'in response to' L.20-22: this sentence is wrong: to my knowledge diatoms do not control lake mixing at all. It should be other way round,

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namely that lake mixing controls diatom community structure but in that case you need other references. L.22: physiographic should be geographic L.25-27: not clear what is meant here. Probably that for each region a calibration dataset is needed because optima and tolerance of diatoms regionally vary?

Page 15892 L.4-8: 2 sentences say the same. Unsure how indirect gradient analysis can be used to establish the link between diatoms and environmental variables. L.9-17: it is true that CCA is widely used, but this technique has its shortcomings as well (see Zhang & Thas (2012) Statistical modelling)

Page 15893 Please use a table in the supplementary material with the information regarding the origin the datasets used. L.16: unclear how the predictor matrix was calculated. Does it represent the mean for each variable in each study? Please also give the rationale for applying this approach. L.18: I would recommend to treat missing values as such instead of replacing them with the median of that value. What is the effect of this approach on the results obtained in the statistical analyses? I suggest to add the number of studies for which each variable was available to Table 1.

Page 15894 L.10: unclear to me how it is possible that only 1 sample was analysed in a study aimed at developing a calibration dataset. L.15: studies from Africa and Antarctica are however available. E.g., Gasse et al (1995) PPP; Jones & Juggins (1995) Freshwater Biology; Verleyen et al. (2003) Antarctic Science.

Page 15895 L.5-6: this statement is a generalization and not true; 2 samples with scores > 2 fall within the 95% confidence interval. 'in' should be 'on' both axes L.8-10: unclear how 2 lakes can lead to three outliers on Fig.2 The methods used to develop Fig.4 should be described in the materials and methods section.

Page 15896 L.2-17 I recommend to delete this part which is a summary of the introduction and hence redundant L.18-22: the other reason why pH explains a large portion of the variation is the fact that a lot of the studies were aimed at developing diatom-based transfer functions. L.27-28: again, or because the gradient in TP was small, similar to

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the hypothesis on the next page.

Fig.3: unclear how it is possible that only 5 data points are shown for 'elevation' when variables measured in less than 10 studies were included. I found it difficult to get a grip on the real data. Maybe a supplementary table with the raw data should be added.

Page 15897 L.24: this statement is out of its context. In Shinneman et al. (2010), the relation between alkalinity and depth might lead to spurious depth reconstructions. It is unclear why this statement is relevant here. In fact, this counts for the entire paragraph which starts on p. 15897 and ends on p. 15898

Page 15898 L.11-14: it is indeed true that the effect of geographical factors has been neglected. However, this is only relevant in for example studies regarding the meta-community structure in diatoms but not for paleolimnological reconstructions L.14-15: climate also affects lake ice cover, lake water mixing regimes etc. This part should be fully discussed. Moreover, rain fall regimes should also be considered under the factor 'climate' L.20-23: please be more specific. What is meant here?

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