**Climate of the Past**
Discussions

*Interactive comment on* "Pollen-based quantitative land-cover reconstruction for northern Asia during the last 40 ka" *by* Xianyong Cao et al.

**Anonymous Referee #2**

Received and published: 3 December 2018

The aim of the study is to use pollen data for quantifying in very general terms the vegetation change in northern Asia over the last 40 ka. A key element in the study is the use the REVEALS method, which accounts for the differences in pollen productivity and dispersal, hence providing more robust abundance estimates than pollen percentage values. In general, I am in favour of suggesting that the paper can be accepted because it is based on a substantial dataset and presents results over a large area which has not been intensively investigated so far.

At the same time, I would urge the authors to amend the paper by making it clearer, more structured and more informative for readers. I found that large sections of the text, especially in Results and Discussion, were hard to follow. One reason is that there are too few references to figures and tables in the paper, making it hard to find

out whether the interpretations presented in the text were sound and really supported by the results. For example, on page 10, the first long paragraph presents many types of results, but the only reference to a figure is at the end of the paragraph "(e.g. G"9, G39; Fig. 2)". Similarly, the next paragraph begins "The turnover in PFT composition is <0.7 SD units in almost all site-groups, except G8 (0.88 SD), G9 (0.73 SD), and G24 (0.76 SD) indicating only slight vegetation change during the Holocene" – are these results shown somewhere in the paper? I did not find them in the figures or tables.

Most of the results in the paper are shown in Fig. 2., which is a very big figure, divided into three parts. It is not an easy figure to follow together with the text. My suggestion would be to section the figure to smaller parts, either as three separate figures (Figs. 2, 3, 4) or sub-panels (Fig. 2a, 2b, 2c). Fig. 1 shows the study regions and the datapoints, but there are too much data squeezed into the figure, so it is a bit messy.

While I understand the motivation of using the REVEALS method in the paper, I also notice that the spreads in the estimated PPE values for different pollen types are remarkable. This can be best seen by looking at the Appendix 2. Consequently, there must be an enormous error associated with these estimates, and that uncertainty should be kept in mind throughout the discussion and conclusions. In addition, in the paper, the PPE value used for Larix is 3.642. But in the Appendix 2 it is indicated that there are two earlier PPE estimates for Larix, 0.00009 and 1.4. What is the value 3.642 based on? Note also that both "RPP" and "PPE" are used as abbreviations for the term "pollen productivity estimates", for example in Table 2 and Appendix 2.

In addition to the use of the REVEALS method, the pollen types are converted to plant functional types (pft) for defining the vegetation types for the study period. After this conversion, the selected 27 pollen types were reduced to only seven pft. This is sometimes useful because it allows a very generalized presentation of past vegetation types, but it also influences the results of the vegetation turnover rate calculations, which the authors have carried out by applying DCCA with their pft data. This results is an extremely simplified measure, where the resulting turnover values includes errors that

stem from the uncertainty in defining the PPE values and from the heavy generalization involved in converting the pollen types to pfts. I would not therefore place too much emphasis for the resulting turnover calculations presented in Fig 3.

Table 2 shows that Corylus is assigned to the plant functional type group "boreal deciduous trees". A "temperate deciduous tree" would probably be more correct. And how did the authors handle the pollen types which belong to two different plant functional type groups (for example, Betula is in boreal deciduous trees and boreal shrubs)

Finally, the sites with pollen data were divided into 42 site groups. Each site groups includes many subregions, which are scattered around northern Asia. It remains unclear why such a subdivision was considered useful and how the site groups were defined. The description on page 8 says that "...we divided the 203 into 42 site groups, based on criteria on geographic location, vegetation type, climate and permafrost. This is a confusing description because one site groups can contain subregions from different parts of Asia, so it is hard to understand how they could have been defined on the basis of geographic location or climate, for example.

---

C3