

Interactive comment on “Sedimentary ancient DNA and pollen reveal the composition of plant organic matter in Late Quaternary permafrost sediments of the Buor Khaya Peninsula (north-eastern Siberia)” by Heike Hildegard Zimmermann et al.

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The manuscript presents the results of pollen and ancient plant-derived sedimentary DNA study obtained from the permafrost sediment core from the Buor Khaya Peninsula (East Siberian Arctic). First of all, the manuscript presents the important methodological techniques of investigation of ancient plant DNA from bulk sediments. In my opinion, sedaDNA is very promising as a reliable additional bioproxy for reconstruction of ancient flora composition. The combination of sedaDNA, pollen and plant macrofos-

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sils analyses can give the maximum knowledge about past vegetation. On the whole, this study is successful attempt to answer for the questions phrased in the Introduction; however, the manuscript needs the moderate revision before publishing.

General comments/questions/suggestions to the authors: 1. What was the source for the plant DNA? Is it possible to determine it? Is it chloroplast, nuclear or mitochondrial DNA? Pollen cells don't contain chloroplasts and if it was possible to determine chloroplast DNA it would be a very reliable method for separation of local and not-local plant taxa. 2. I don't like how the sedaDNA and pollen diagrams ('stratigrams') are structured. It is very hard to find any taxa on them. I suggest structuring them in ecological way – herbs, shrubs, trees etc. or explain what the principle of such structure was. 3. I suspect that in the lower stratigraphical zones pollen and other material can be redeposited. Radiocarbon dating, amount of pre-Quaternary pollen and spores indirectly confirm this suggestion. How do you explain the inversion in radiocarbon dates? Maybe, it is contamination from the lower more ancient layers? Why do you not use pollen concentrations that can be an additional marker of redeposition? What part of the core contains higher percentages of exotic DNA sequences (contamination)? 4. What taxa belong to NPPs in this study? Page 9, line 21: 'pollen, spores and non-pollen palynomorphs (NPPs)'. Table 3 ('Number of non-pollen palynomorphs for each sample') contains algae, fungi, mosses, ferns (!), lycopods (!) and pre-Quaternary spores (!). Page 17, lines 13-14: 'A total of 1,092 NPPs were counted and assigned to 25 taxa, comprising four mosses, two spikemosses, six clubmosses, three ferns, six fungi and four green algae'. Usually, in pollen study to NPPs belong fungi, algae, remnants and eggs of animals etc.; objects which can be determined in the pollen slide after chemical treatment. Spores of higher vascular plants don't relate to NPPs (as a rule, but you can explain your position). 5. I didn't understand for what you calculated terrestrial-aquatic and Poaceae-Cyperaceae ratios. You did not use it in discussion. I didn't also realize where is the interpretation of the PCA analysis in this study. 6. I suggest constructing the age-depth model for the upper part of the core. CONISS reveals two pollen zones in upper Pleistocene-Holocene part (Fig. 6: TerrPZ3). Maybe, it is the

border between YD and Boreal. 7. Where is S3? Page 12, lines 7-8: 'The complete taxa-list is available in S3'. 8. How do you explain the hiatus between last radiocarbon date (9700 ± 50 14C yr BP) on the depth of 0.3 m and modern sample on the depth of 0.1 m?

Specific comments: Page 1, line 28: 'a shrub tundra spectrum' – spectra (plural). One sample - one spectrum, several samples – several spectra. Or you should use 'pollen complex'.

Saliceae, Pooideae etc. are the tribes. Please, specify what nomenclature system you used in this study.

I found the mistakes in Latin. 'Osmuda' – Osmunda (everywhere) Polypodiaceae is the family mainly of tropical ferns. Use Polypodiophyta or specify what nomenclature system you used in this study. 'Botrycoccus' – Botryococcus (in the text) 'Cichoriidae' – Cichoriodeae (Fig.6)

Page 13, Line 25. 'assigned to 21 swamp or aquatic taxa' . In S4 only 20.

Page 15, Line 11: 'to 53 taxa, including indeterminable and pre-Quaternary pollen.' Indeterminable and pre-Quaternary pollen are not taxa and cannot be included in the taxa list.

Page 19, Line 1: 'the under-representation of Salix in comparison to other plant functional types'. Plant functional type is the unit of biome reconstruction. You should rephrase this sentence.

Line 20: 'Compared to the number of vascular plant taxa (58) and bryophytes (20) recorded by pollen analysis'. Where is the list with moss taxa, determined by pollen analysis?

Page 23. Line 27: 'In drier periods'. You have reliable chronology for the upper part. When were drier or wetter periods?

Page 24, Line 10: 'Published pollen records for 11.7–10.6 kyr BP are dominated by Cyperaceae and Poaceae. Shrub pollen increased at approximately 9 kyr BP (Andreev et al., 2011), with up to 60 % of *Betula* in the Khorogor Valley near Tiksi (Andreev et al., 2011; Grosse et al., 2007). These results match well with the pollen data presented here.' It is not true. In your study *Betula* pollen increased at least 2 kyr earlier (Figs 2,6).

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