

Interactive comment on “Lena River Delta formation during the Holocene” by D. Bolshiyanov et al.

Anonymous Referee #1

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General notes:

This paper presents a formation scenario for the Holocene part of the Lena Delta, N Siberia. It is mainly based on age determinations of deltaic sections and pollen data. It links peat formation in the delta with repeated sea level changes during the Holocene.

Specific notes (I):

My major concern with the paper is that it postulates a “marine” forcing on the terrace formation. The authors claim it based on peat growth observation. From my viewpoint I don't need a marine forcing to explain peat growth on a delta plain, this can happen in delta channels dominated by fluvial action, with high-energetic sedimentation conditions, with migrating river meanders, repeated erosion and accumulation, periodic and

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episodic flooding events and such. This also can explain age inversions in the sampled sections. When the authors present a curve with repeated sea level rise and fall and an amplitude of 5 m during the Holocene I miss more data to support this; e.g. marine organisms in deltaic sediment sections, marine chemistry signals in the permafrost soils, or references to marine papers documenting sea level change in that time in the area. Unless such data is provided I don't support their interpretation.

I can see a value of the paper, if it concentrates more on showing where the main Holocene delta lobes formed based on age distributions in the deposits.

Specific notes (II):

p. 4090, In 2: No references are given with regard to the Ice Complex (IC) formation. But there are many... Ice Complex formation took place during the Late Pleistocene. The sea level was much lower than present. Why should the IC formation be linked to a shore line that was hundreds of km further north? Maybe the conception of terraces are different from mine. From my understanding the Holocene sea level rise and the modern proximity of the shoreline make ancient deposits in the delta to erosional remnants. But their Pleistocene origin was independent from a shoreline that was far away at that time.

p. 4102, In 7: I checked this reference and didn't find any data on saline sediments.

p. 4088, In 18: The radiocarbon ages are not calibrated. Why? They all fall into the age frame, which can be calibrated. This would make the data more comparable to other sites. I suggest to use the calib-program (see: <http://calib.qub.ac.uk/>) and also to use the common expressions for radiocarbon ages given in the relevant citations.

The expression of sediment ages is not uniform; sometimes “Ka”; e.g. p. 4086, In 15-16 and elsewhere, sometimes “yr b.p.”; e.g. p 4093, In 17, and elsewhere, Fig. 1, sometimes without any; e.g. p 4095, In 25, sometimes “radiocarbon years” (e.g. p 4100, In 15), sometimes “kyr. BP” (e.g. p 4102, In 28)

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Table 1: The use of the wording "estuarine terrace" is misleading or wrong. To my knowledge it demands a tidal influence into the hinterland of a shoreline. Is there any evidence for this; e.g. hydrochemical data? Maybe the authors have a different conception for the term "estuarine". They should explain.

The use of the wording "marine terrace" is misleading or wrong. To my knowledge it demands a marine influence into the hinterland of a shoreline. Is there any evidence for this; e.g. hydrochemical data, marine organisms in the sections? Maybe the authors have a different conception for the term "marine". They should explain.

Fig. 2: I don't see the point with this figure. Why is this section selected? Four samples have been studied from a 5.5 m section. This is not an impressive record.

Fig. 5: Are the ages calibrated? It would help. What is "coarse" sediment? Gravel? Melted ice sediments are supposed to be 500-200 years old. This does not fit to Fig. 1, where melted sediments are several thousand years old (see also descriptions on p. 4091) Informative legend, but hardly based on data, which can be found in the paper. Is it all in Makarov (2009)? This reference is difficult to verify for non-Russians.

Fig. 7: I don't see the data to support this concept.

Fig. 8: First subset 40.000-30.000 yr BP; there is no data given in the manuscript for this period making it purely speculative. And it does not fit to the scope of the paper based on the title of the MS "... during the Holocene". Second subset 17000-15000 yr BP; "Alluvial-marine sediments". This is hardly possible or at least a misleading label. At that time the sea level was about 100 m lower than modern and the setting must have been continental. And it does not fit to the scope of the paper based on the title "... during the Holocene" (same as above).

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