

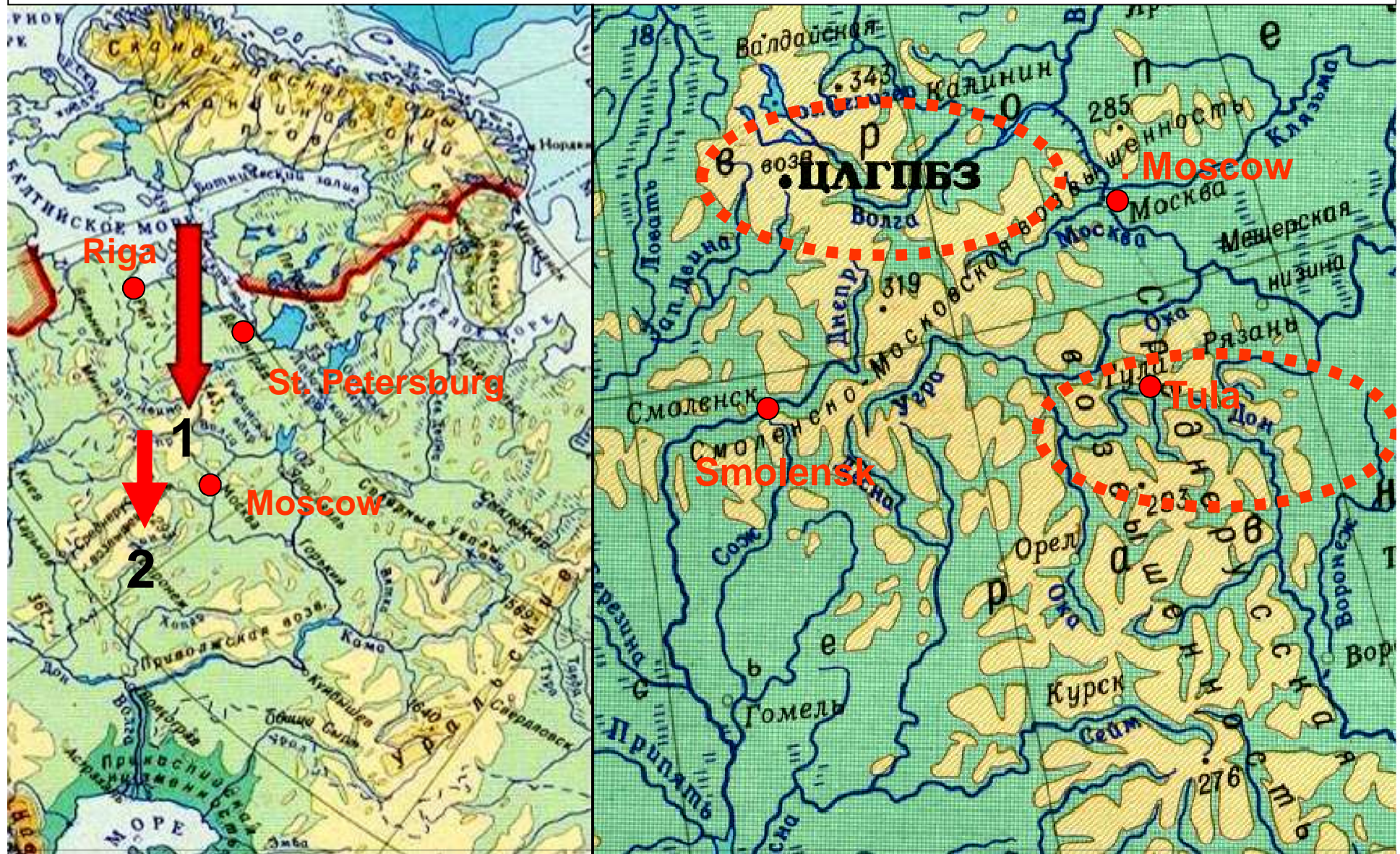
**Paleoenvironment reconstructions for the south of  
Valdai Hills (European Russia) as paleo-analogues  
of possible regional vegetation changes under  
short-term climatic changes .**

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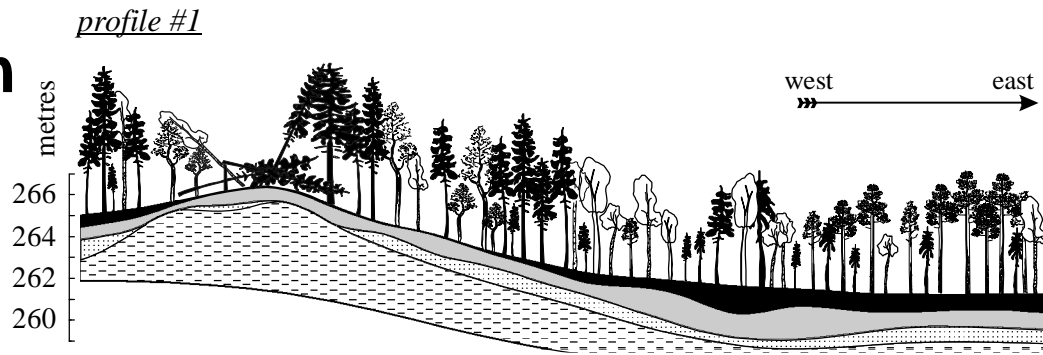
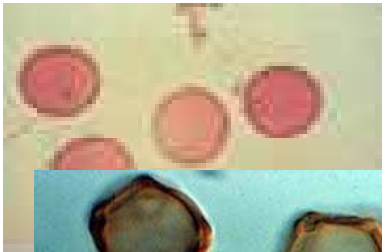


# Geographical position of the key regions



1. - The Central Forest Reserve is situated in the center of the European part of Russia, in the south part of the Valdai Hills, (Tver' region)
2. "Kulikovo Battle Field" - the Central Russia Hills (Tula region)

# Reconstruction of vegetation



# Reconstruction of climate

Reconstruction of climatic parameters the base of high resolution pollen records. The quantitative characteristics of the climate were calculated using the floristic method of V.P. Grichuk (1985) information statistical method (Klimanov, 1976, with present modification). The mean statistical errors for the reconstructions were  $\pm 0.6^{\circ}\text{C}$  for mean annual and July temperature, and  $\pm 1^{\circ}\text{C}$  for January temperature, and  $\pm 50$  mm for total annual precipitation.

# Paleogeographical data

Pollen, plant macrofossil and radiocarbon data from several profiles of both buried organic sediments and modern raised bogs.

To describe possible dynamics of the vegetation cover, paleoclimatic and paleoenvironmental reconstructions of the past epochs are used as analogies for future predictions. Taking into account expected growth of the global temperature due to climatic changes in these studies, two situations assuming increases of global temperature by 1°C and 2°C are generally considered. According to data of paleogeographic investigations, the thermal maximum of the Holocene (about 6-5.5 ka BP) corresponds well to the first situation; the optimum of the last Interglacial (Mikulino-Eemian-Sangamon, stage 5e of the deep-sea oxygen curve, about 125 ka BP) period that could be considered as a paleoanalogue for the second one (Velichko et al. 2004).





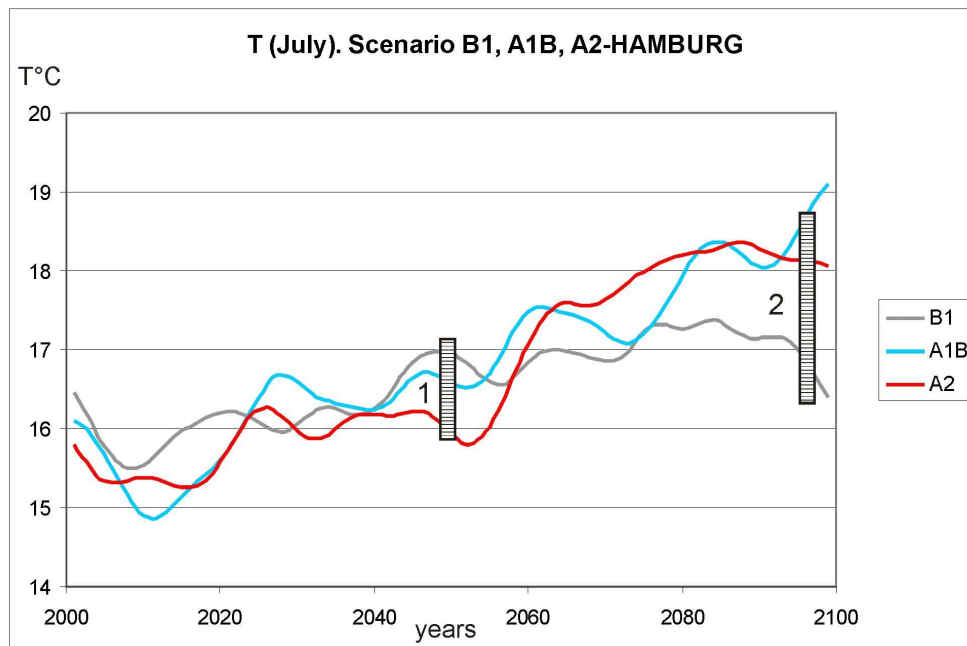
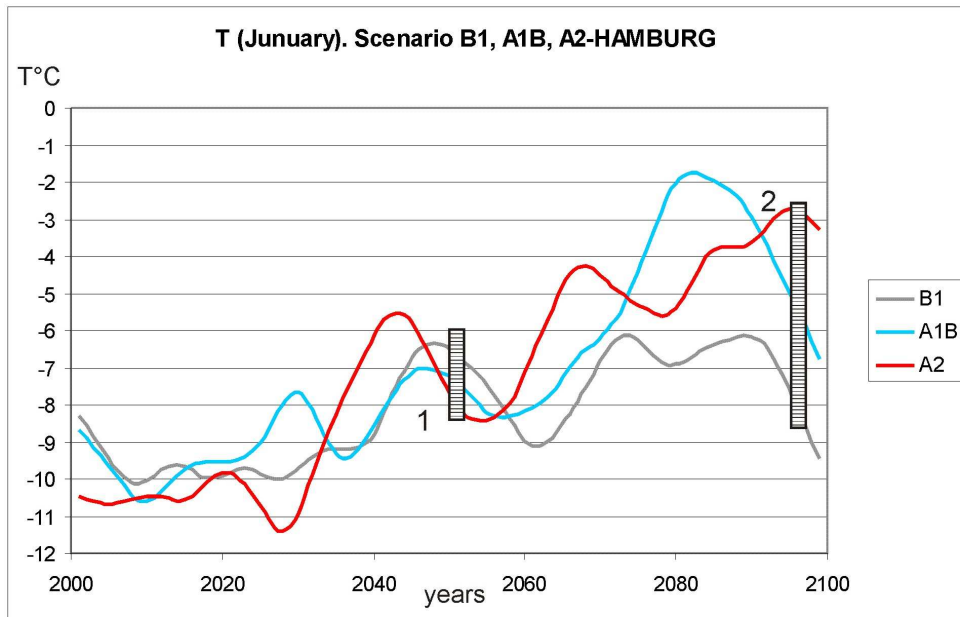
# Key region 1

The Central Forest State  
Biosphere Natural Reserve

This region can be regarded as one of the key region for investigated of climate and landscape dynamics in the past, because it situated in the watershed area and the landscapes are the most typical for this geographical zone.

The vegetation cover is represented by original south taiga ecosystems, there the main process of landscape dynamics have not been disturbed by anthropogenic activity.

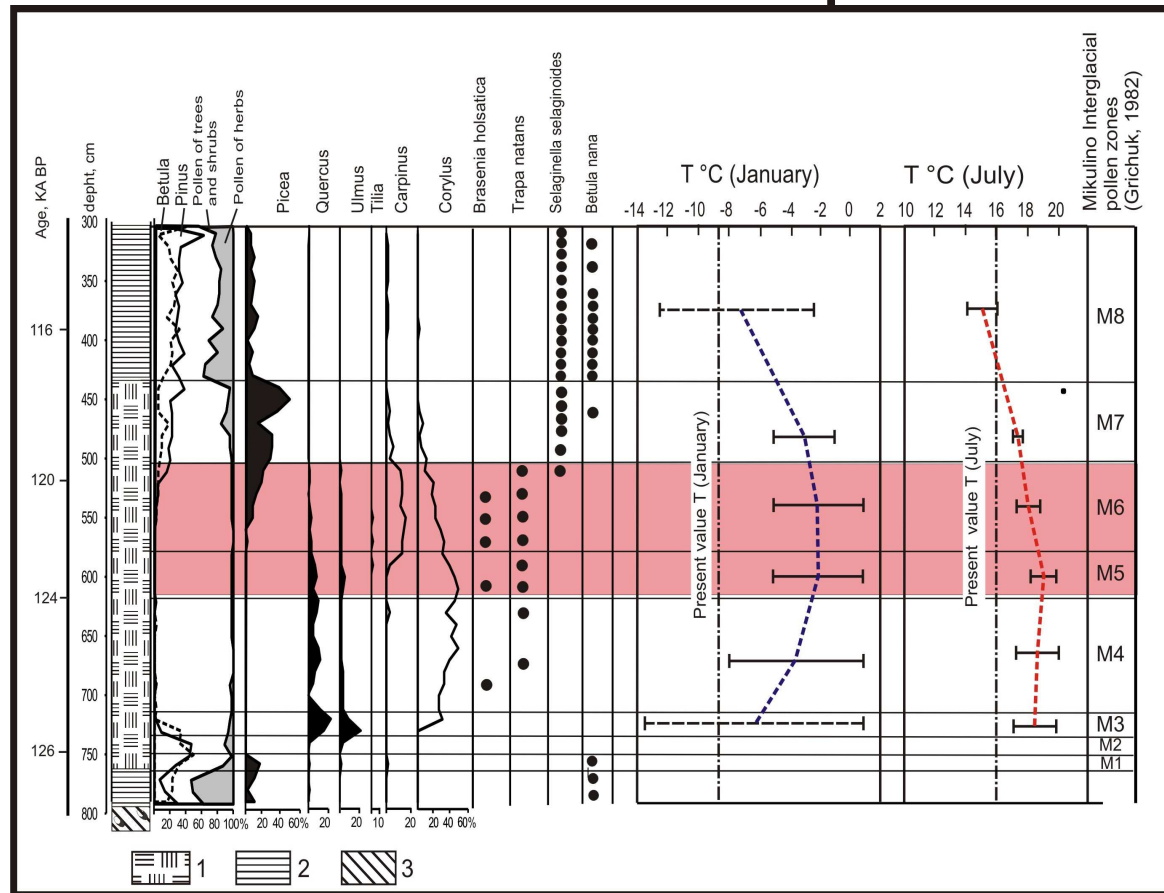
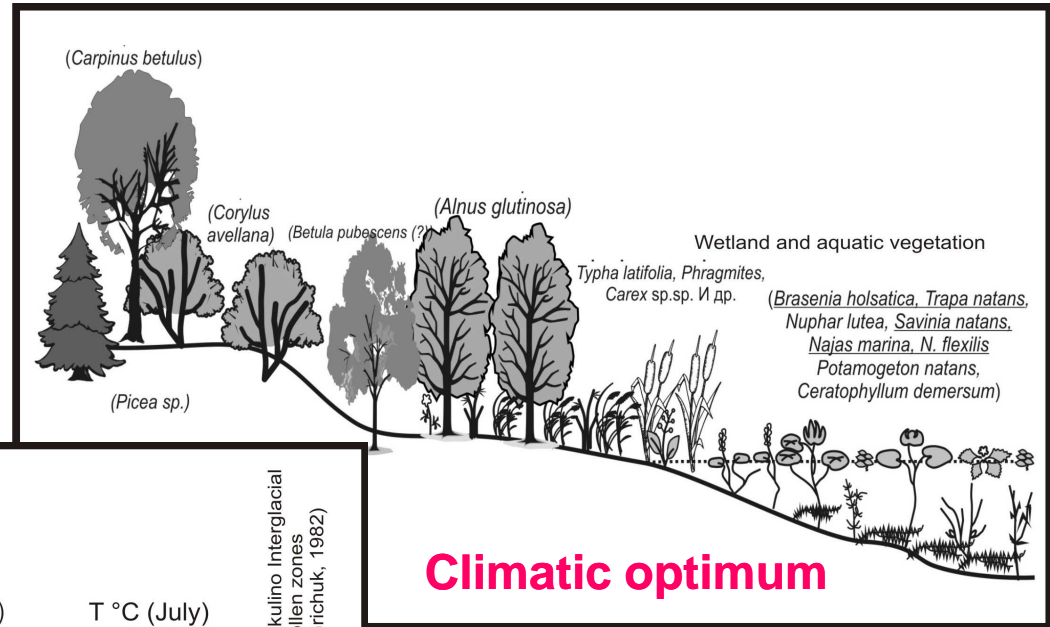
. The vegetation is typical for south taiga and can be consider as an example of original forest for this area. Spruce (*Picea obovata Ledeb.*) forests are dominated (47%), pine (*Pinus sylvestris L*) forest occupied only 10% of the territory, and alder forests (*Alnus glutinosa L.*) are situated in the river valleys (1-2%).



**Scenarios of the proposed climatic changes for the area of Valday Hills using the global climatic model ECHAM5 (Roeckner et al. 2003) . The smoothed trends (20-year time averages) were calculated using mean values from 3 model runs for a grid point (56.89°N, 33.75°E) located close to the CFSNBR area.**



# Optimum of the last Interglacial paleoanalogue for the increase of global temperature by 2°C



*The January and July temperatures of the last Interglacial were reconstructed by Grichuk's method of climagrams.*

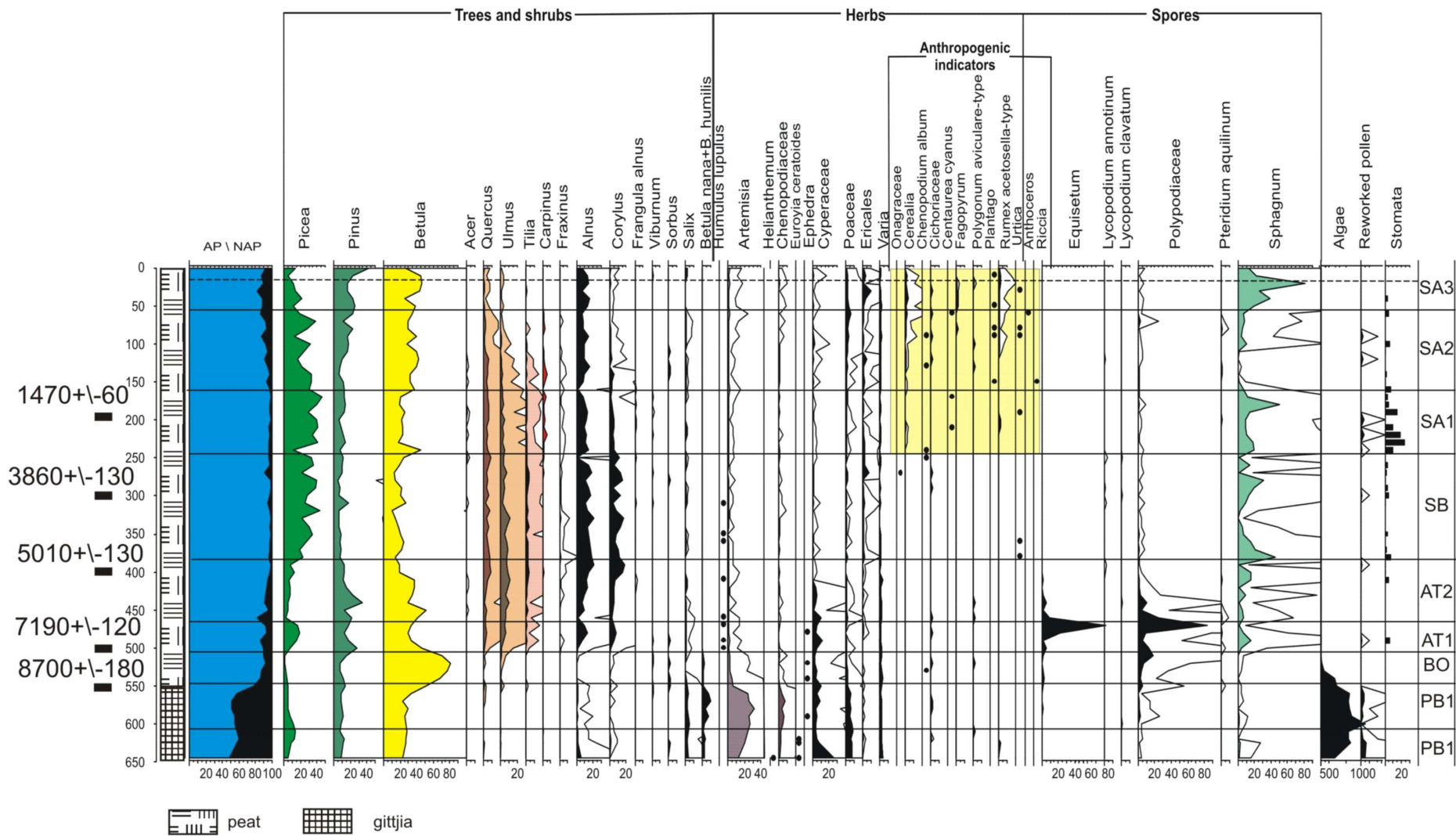
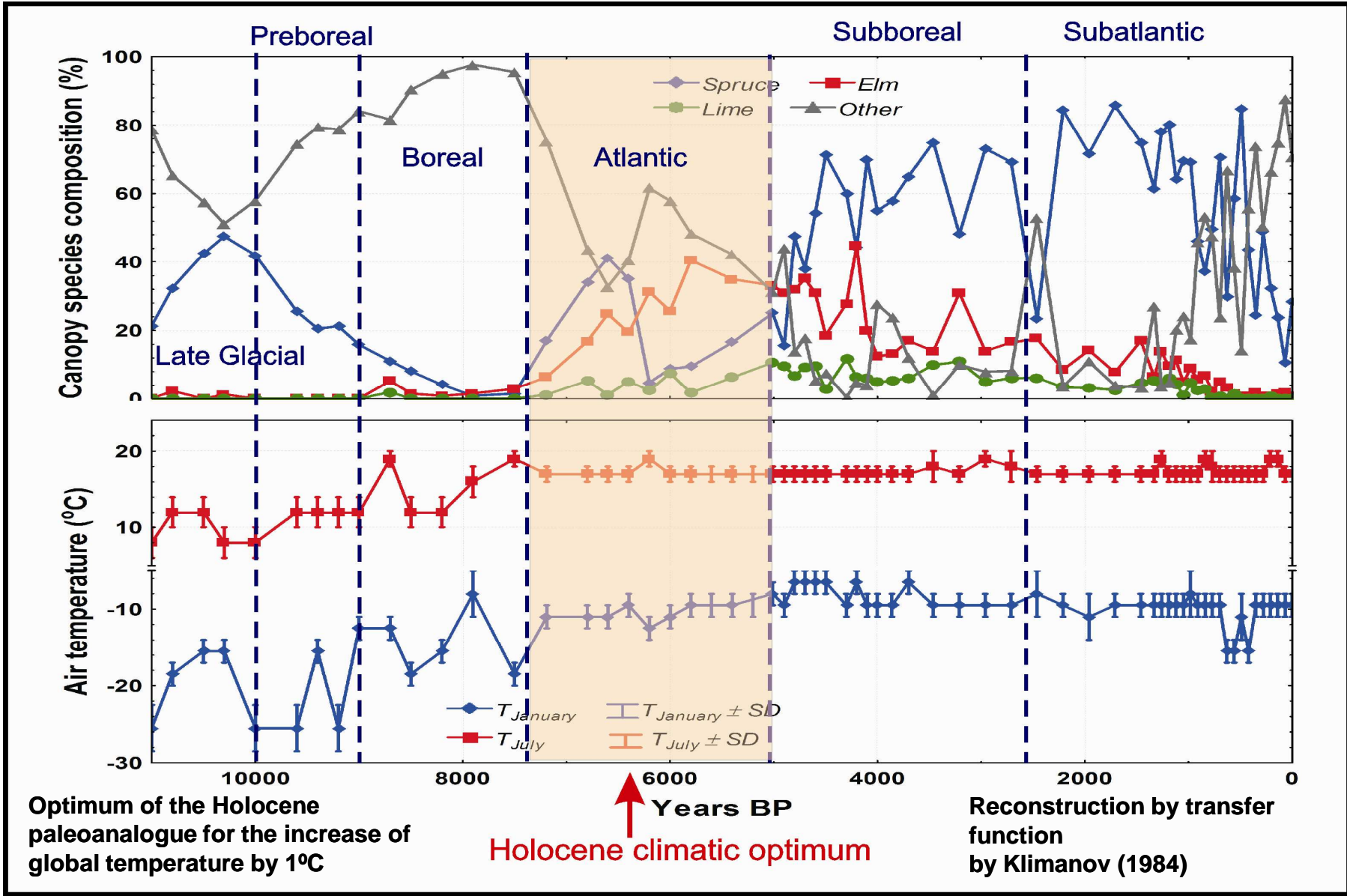


Fig.3. Pollen diagram of borehole in “Staroselsky moch” peatbog. Pollen sum: AP+NAP.. Clear curves represent x10 exaggeration of base curves, "●" presence of taxa under 2%.



# Reconstructed canopy species composition and temperatures in the Holocene





## ***Key region 2***

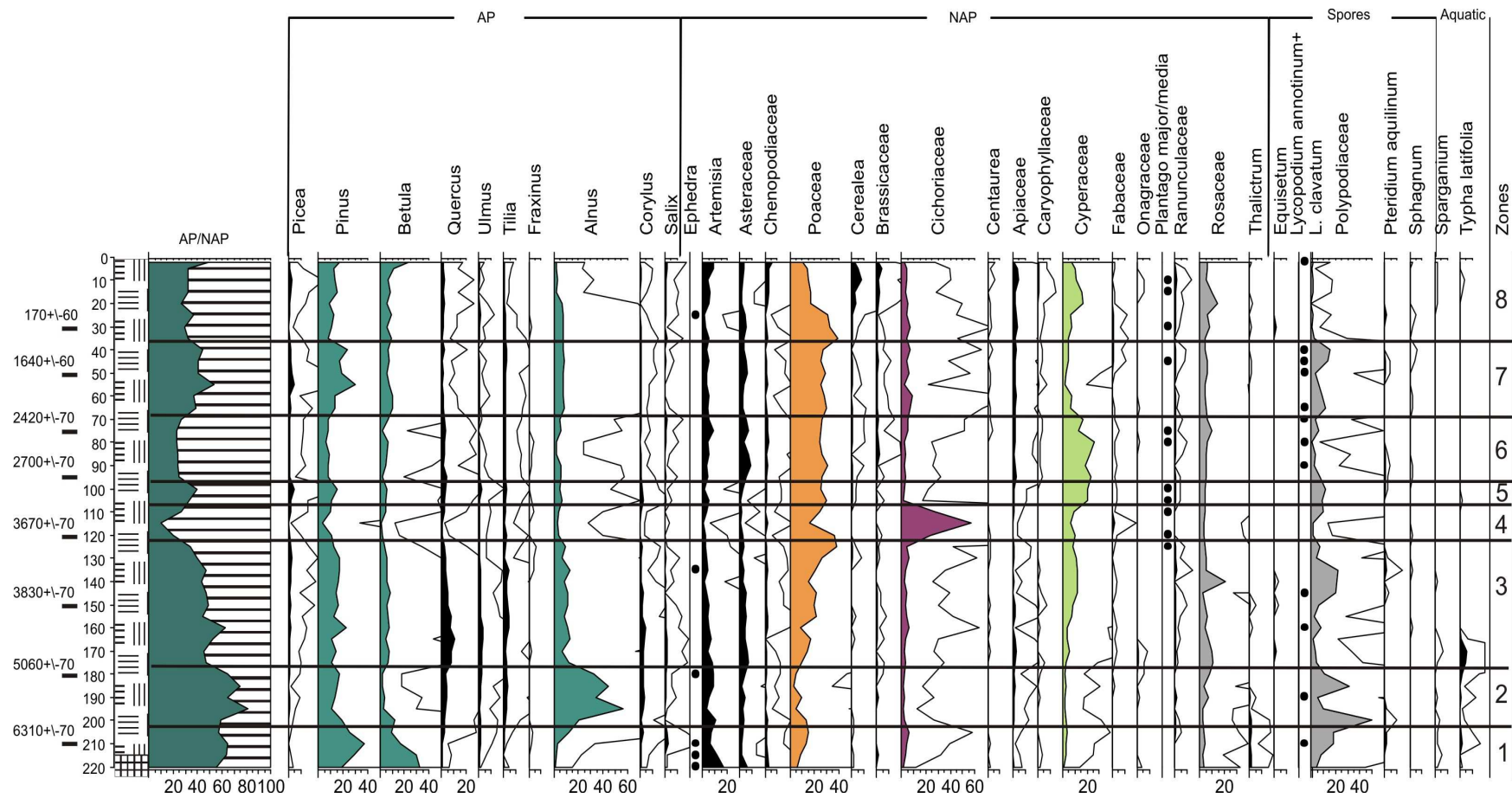
***Forest steppe region  
“Kulikovo Battle field”***

***The ecotone region being an intermediary between the steppe and forest zones is highly sensitive to even minor climate changes. An important bio-climatic limit, so called the ‘null area’, featuring the precipitation/evaporation balance, locates within this territory.***

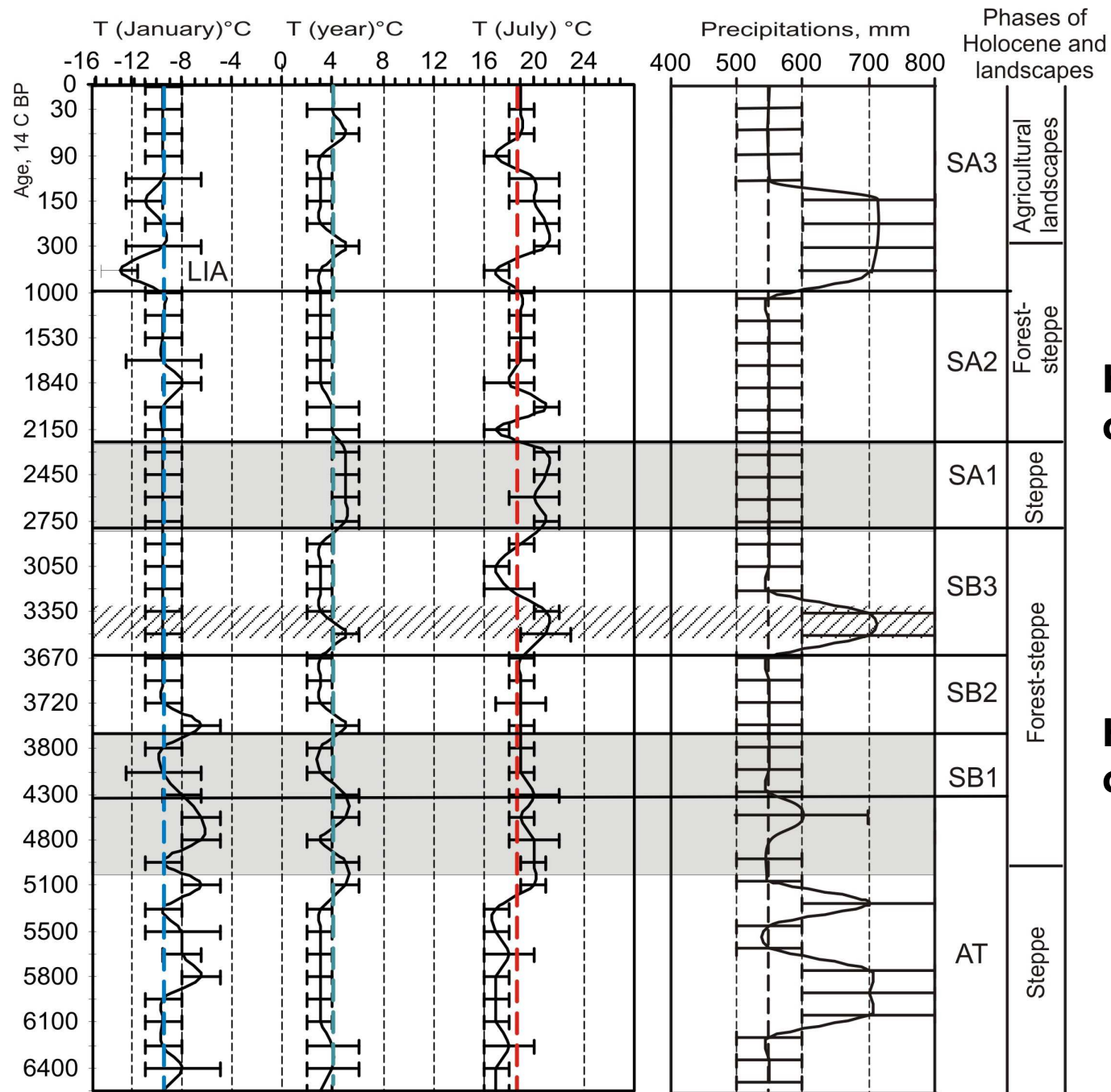




# Pollen diagram of the “Kulikovo Battle Field” section



■ Horizons with high amount of macro charcoal remains



**High frequencies of fires**



**catastrophic mud-and-stone flows**



**High frequencies of fires**





# Conclusions

- **South taiga vegetation zone:**

Provided climatic end environment reconstructions have shown that the most rapid vegetation changes in the Holocene and the Last Interglacial occurred during at least several centuries or millennium, while the observed temperature growth spanned a few decades only. One can expect a lag between climate and vegetation dynamics and catastrophic ecosystem changes are unlikely to occur in XXI century.

- **Forest-steppe vegetation zone:**

Climatic reconstructions suggest that landscape dynamics in the forest steppe zone during the late Holocene were determined by changes in effective moisture (an excess of precipitation over evaporation). Frequencies of fires increased under growth of summer temperatures by 1-3°C compare to their present values and amount of precipitation close to modern climate. On the other hand, the increase of precipitation could be a reason of catastrophic erosion and accumulation processes in river valleys and ravines.



**Thank you for attention**