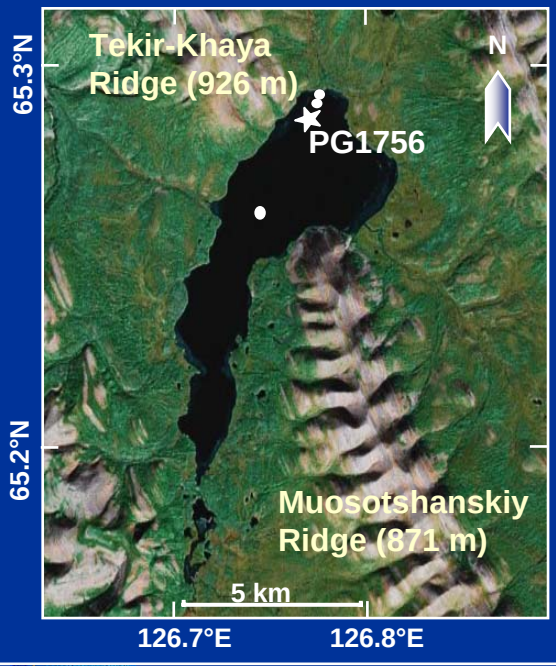
RECONSTRUCTION of the HOLOCENE environmental history of the VERKHOYANSK REGION (northeastern SIBERIA, RUSSIA) inferred from high-resolution POLLEN studies

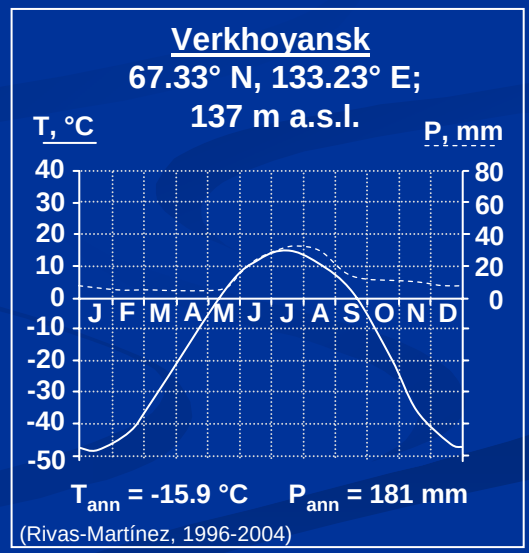
Stefanie Müller

Freie Universität Berlin

Institute for Geological Sciences, Palaeontology

Regional setting





XII IPC VIII IOPC BONN, Germany, 2008

INTRODUCTION

Stefanie Müller: Reconstruction of the Late Quaternary environmental history of the Verkhoyansk Region (northeastern Siberia, Russia) inferred from high-resolution pollen studies

Field work

➡ was performed in spring 2005 during a Russian-German coring campaign financed via the DFG


Diekmann 2005

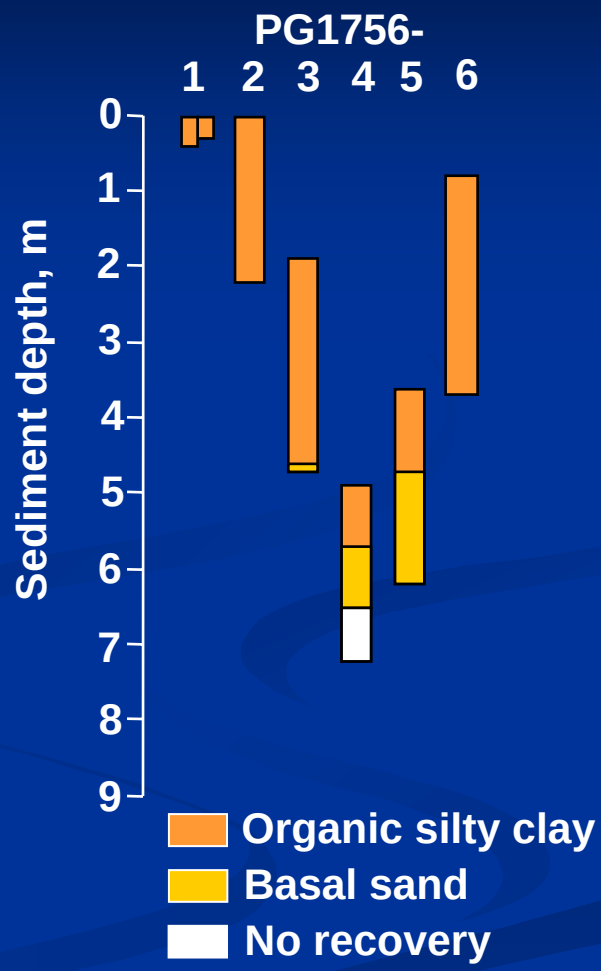
6.6 m core PG1756

⬆

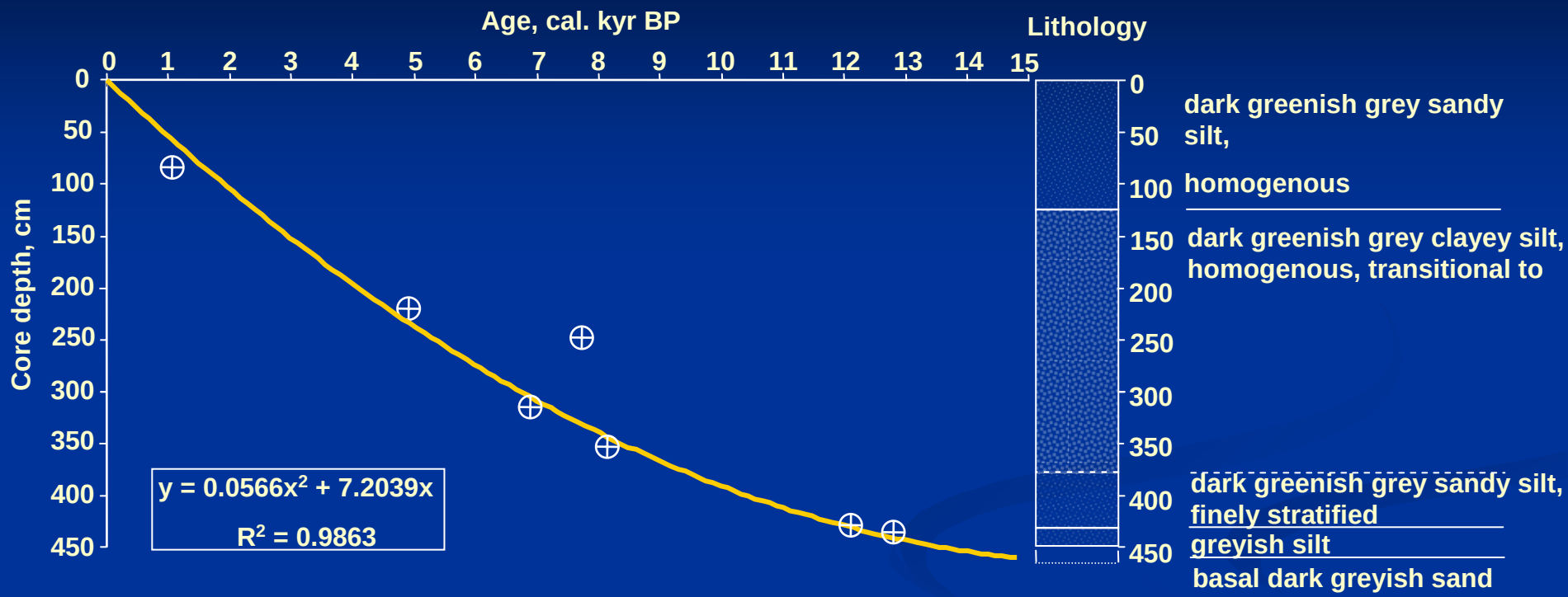
a total of 35 m of sediment cores were taken

⬆

- University of Yakutsk, Ecological Institute
- Russian Academy of Science, St. Petersburg, Limnological Institute
- AWI Potsdam, Periglacial Research Section

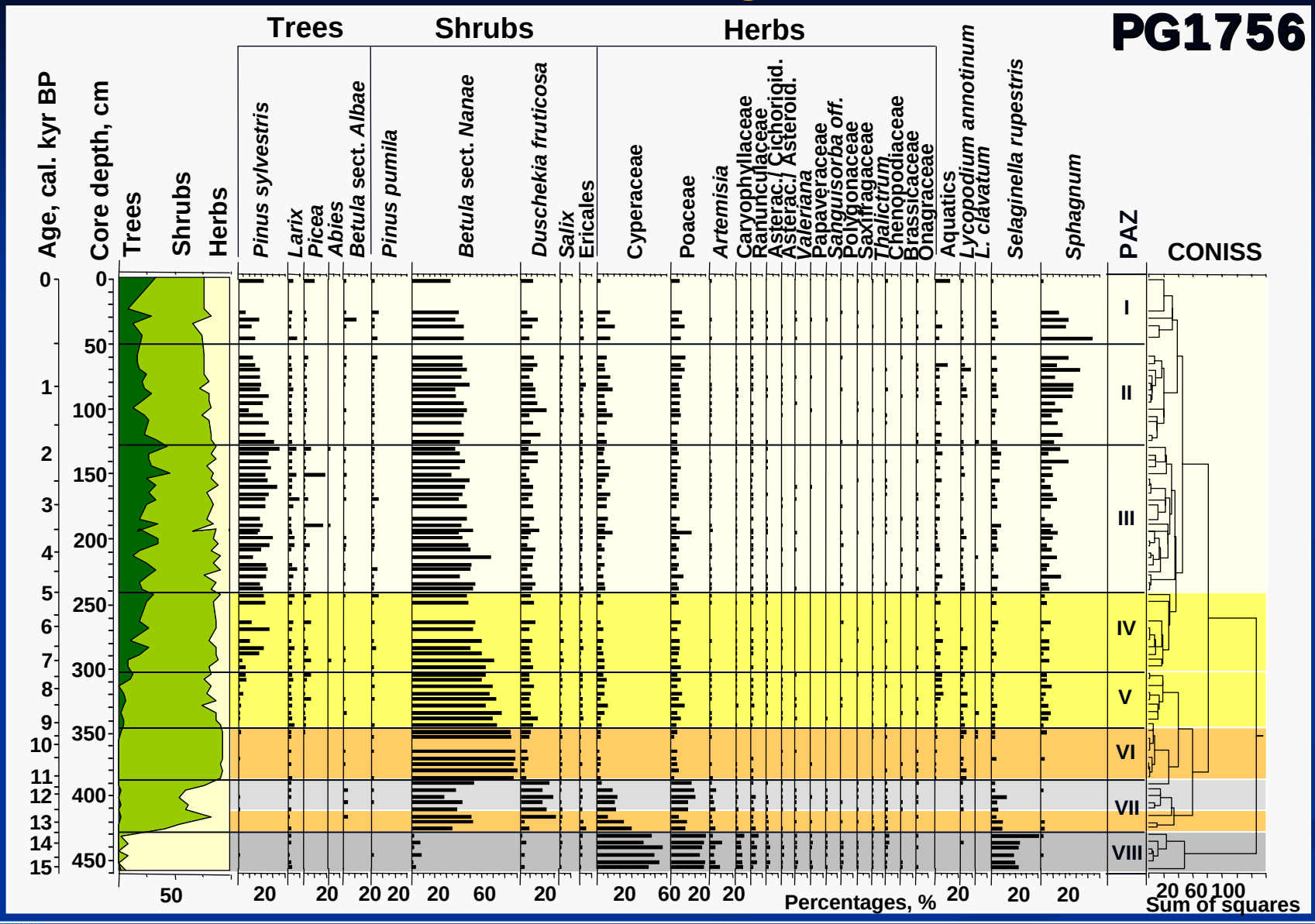


Age-Depth-Model



- we used a polynomial function for the age-depth calculation
- lake sediment core PG1756 covers the last 14.9 kyr

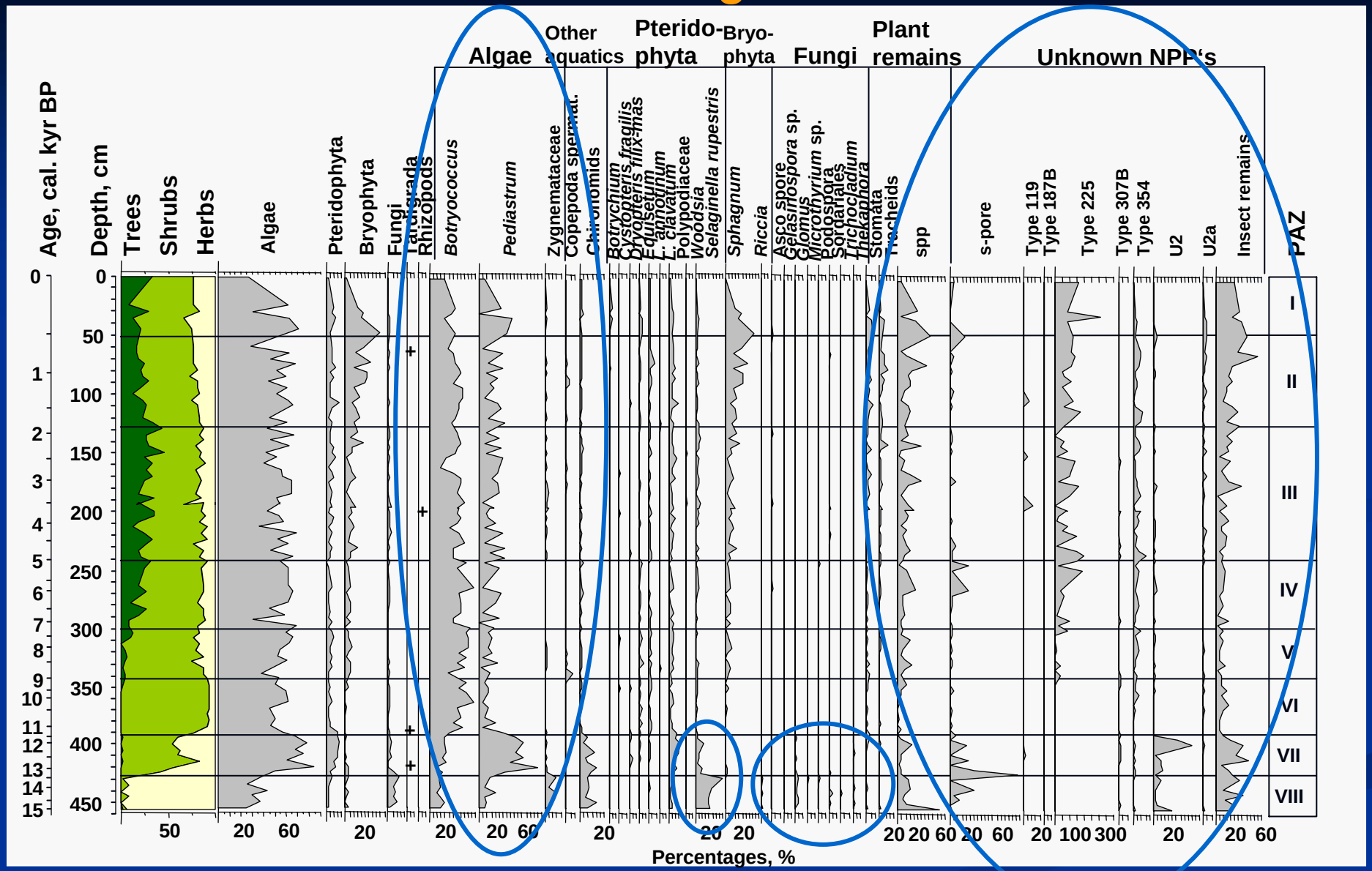
Pollen diagram



RESULTS

Stefanie Müller: Reconstruction of the Late Quaternary environmental history of the Verkhoyansk Region (northeastern Siberia, Russia) inferred from high-resolution pollen studies

NPP diagram



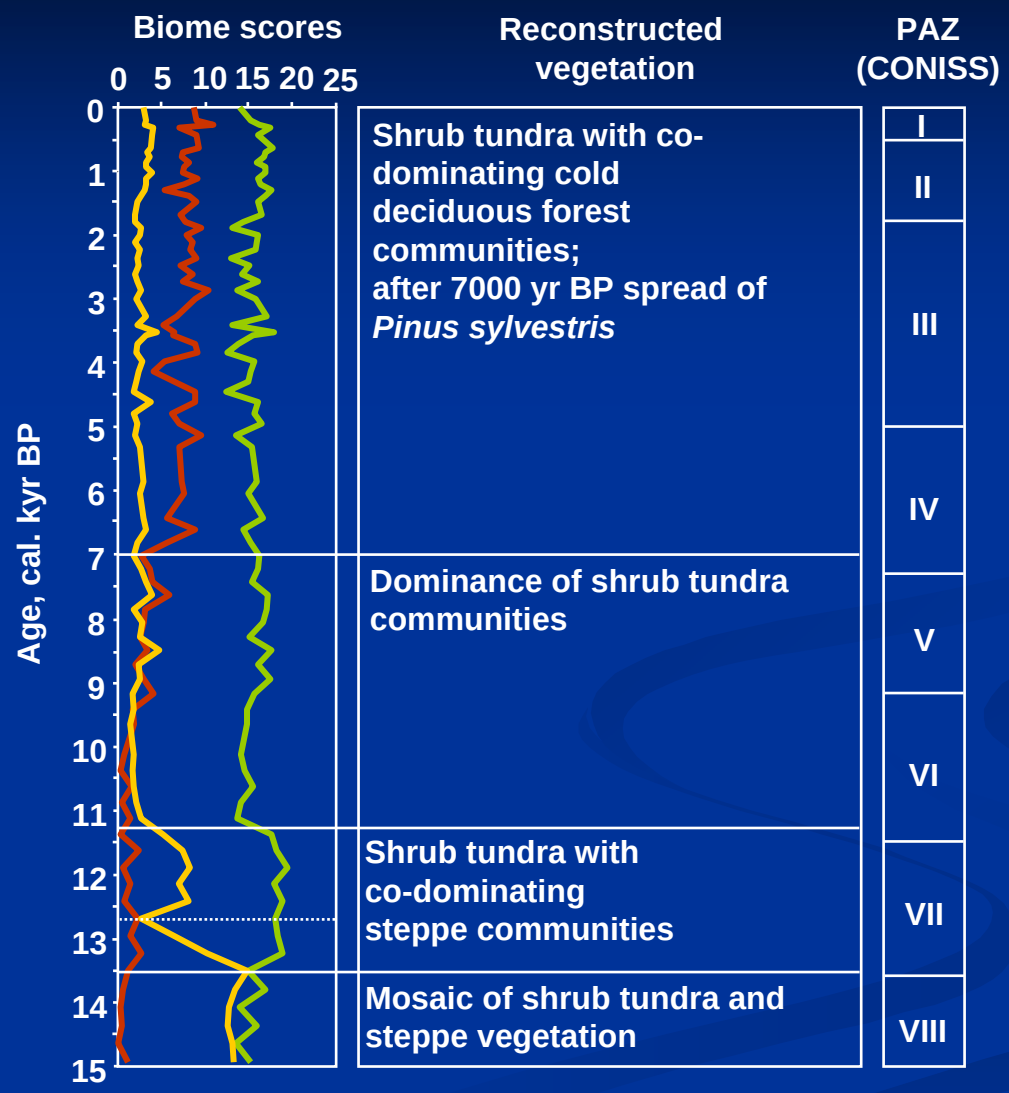
RESULTS

Stefanie Müller: Reconstruction of the Late Quaternary environmental history of the Verkhoyansk Region (northeastern Siberia, Russia) inferred from high-resolution pollen studies

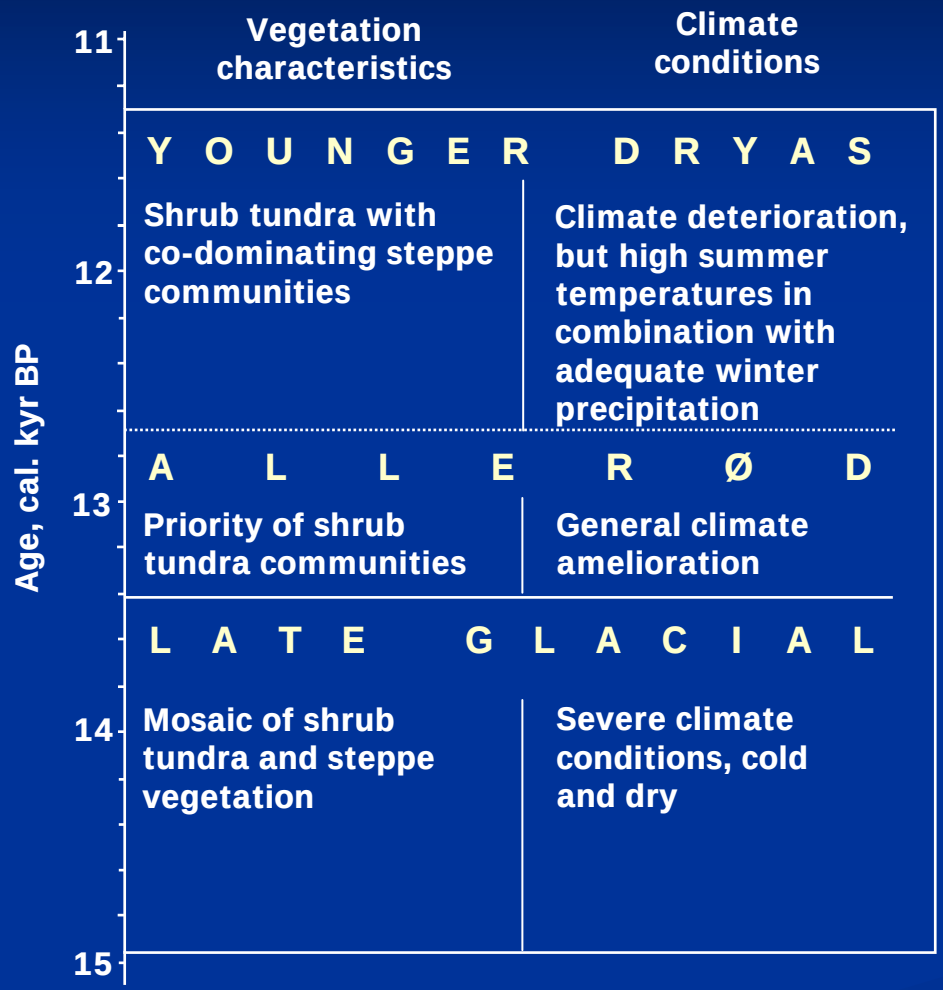
Biomization method

- we applied the biome reconstruction method/“biomization technique“ first described by Prentice et al., 1996
- objective assignment of pollen taxa to plant functional types/PFTs (stature, leaf form, phenology, climatic tolerances) ...
- ... and to biomes on the basis of modern ecology, bioclimatic tolerance and geographical distribution of pollen producing plants
- we used the taxa-PFT-biome assignment suggested by Tarasov et al., 1998 and 1999 for northern Eurasian vegetation
- all terrestrial pollen taxa were used for the biomization but among them only 28 taxa exceeding 0.5% played a role in the reconstruction

Vegetation reconstruction



Reconstructed characteristics of the Holocene environment in the Lake Billyakh area I



Modern ‚analog' vegetation

CONCLUSION

Stefanie Müller: Reconstruction of the Late Quaternary environmental history of the Verkhoyansk Region (northeastern Siberia, Russia) inferred from high-resolution pollen studies

Reconstructed characteristics of the Holocene environment in the Lake Billyakh area II

Age, cal. kyr BP	Vegetation characteristics	Climate conditions
0	**LATE HOLOCENE**	
1	Shrub tundra with co-dominating cold deciduous forest communities; Peak in the cold deciduous forest biome scores after 7000 yr BP is due to spread of *Pinus sylvestris*	Approach to modern conditions
2		
3		
4		
5		Warmer than present mid-Holocene summers
6		
7	**EARLY HOLOCENE**	
8	Dominance of shrub tundra communities, accompanied by meadow vegetation	Favourable milder climate conditions
9		
10		
11		

Modern ‚analog' vegetation

CONCLUSION

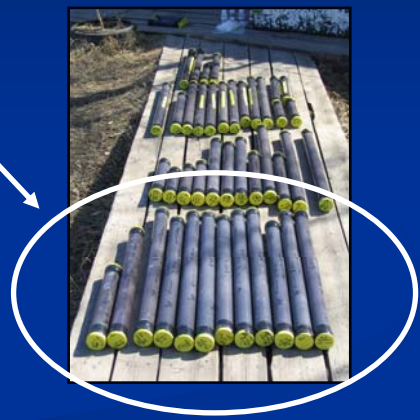
Stefanie Müller: Reconstruction of the Late Quaternary environmental history of the Verkhoyansk Region (northeastern Siberia, Russia) inferred from high-resolution pollen studies

Summary

- Our reconstruction demonstrates substantial changes in the regional vegetation of the Verkhoyansk Mountains during the past 15 kyr.
- Major changes in the pollen assemblages and vegetation can be associated with well recognised large-scale palaeoclimatic events: Late Glacial interval (14.9-13.5 kyr BP), Allerød warming (13.4-12.5 kyr BP), Younger Dryas cooling (12.4-11.3), onset of the Holocene (11.2 kyr BP) and mid-Holocene (7-2 kyr BP) thermal optimum.
- Younger Dryas climate was less severe as conditions before 13.5 kyr BP, as suggested by higher tree and shrub pollen.
- The pollen record suggests continuous presence of larch trees in the study area during the last 15 kyr. This confirms the assumption of Grichuk (1984), who compiled LGM vegetation maps, which show boreal conifer and deciduous trees in southern and central Siberia between 55 and 65°N, suggesting many scattered refugia from which tree vegetation could quickly spread as climates warmed.

Future plans

- Pollen analysis of the longest core PG1755 (9 m), taken from the lake center, spanning the last 30-40 kyr



- Reconstruction of lake level changes
- Verify the presence of larch in the study area during the LGM
- Refine the vegetation and climate reconstruction of this particular area using quantitative vegetation and climate reconstruction methods

Thanks to . . .

Bernhard Diekmann, Andrei A. Andreev and the field crew

Pavel E. Tarasov and Frank Riedel

German Research Foundation (DFG), RI 809/17-1,2

… and special thanks to the audience !

ACKNOLEDGEMENTS

Stefanie Müller: Reconstruction of the Late Quaternary environmental history of the Verkhoyansk Region (northeastern Siberia, Russia) inferred from high-resolution pollen studies