

Sedimentary DNA analyses decipher past and present aquatic plant diversity in Siberian and Tibetan lakes

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photo: Stefan Kruse



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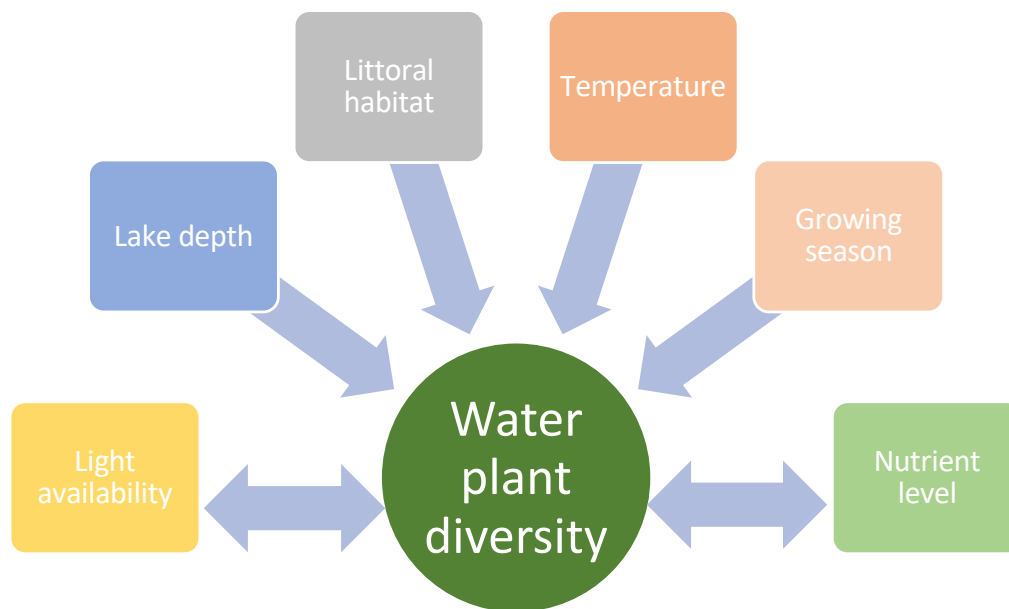
Background & Research questions

Recent anthropogenic warming is strongest in high latitude and altitude regions and increases water plant growth in freshwater ecosystems, which e.g. in shallow arctic lakes affects the overall primary production as well as carbon flux and cycling, but consequences for the overall primary production remain unclear ¹.

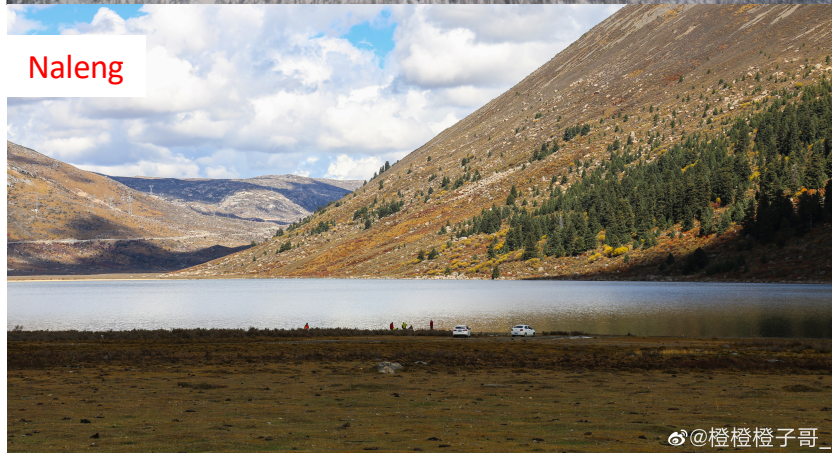
¹ Lauridsen et al. 2020, Aqu Sci

In this study we aim to decipher....

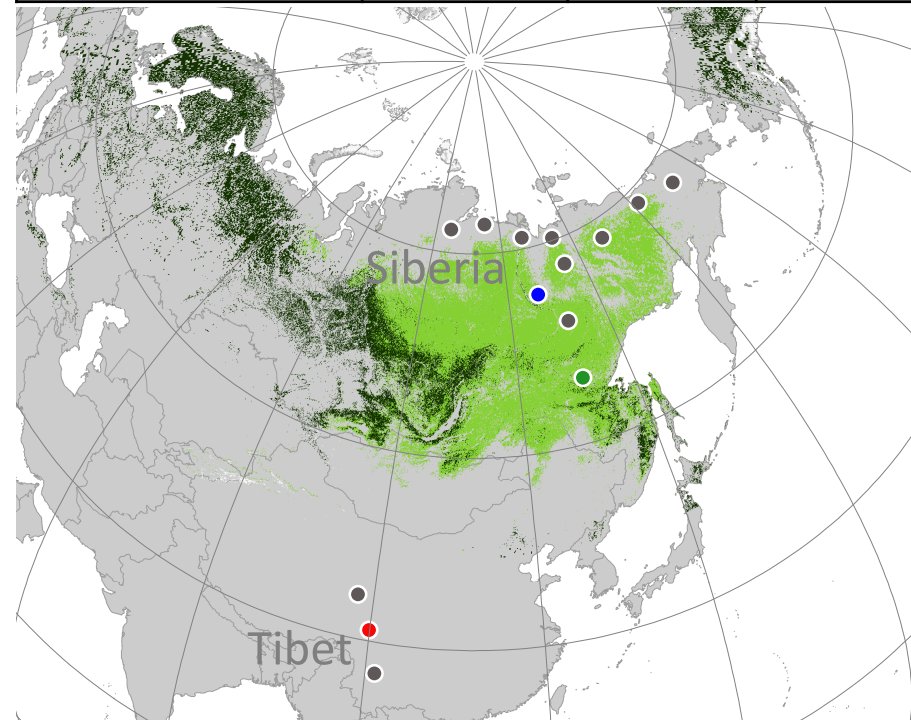
- Which environmental parameters affect water plant richness & composition in Siberia and Tibet?
- How did water plant diversity change during Late Pleistocene/ Holocene transition?
- How might water plant diversity change under further warming in future?



Extreme localities – Siberia (SB) & Tibet(TB)



Lake samples	Location	N _{Samples}	Age
SB surface	Siberia	117	modern
TB surface	Tibet	62	modern
Bilyakh core	Siberia	43	~ 42 kyr
Bolshoi Toko core	Siberia	35	~ 39 kyr
Naleng core	Tibet	69	~15 kyr



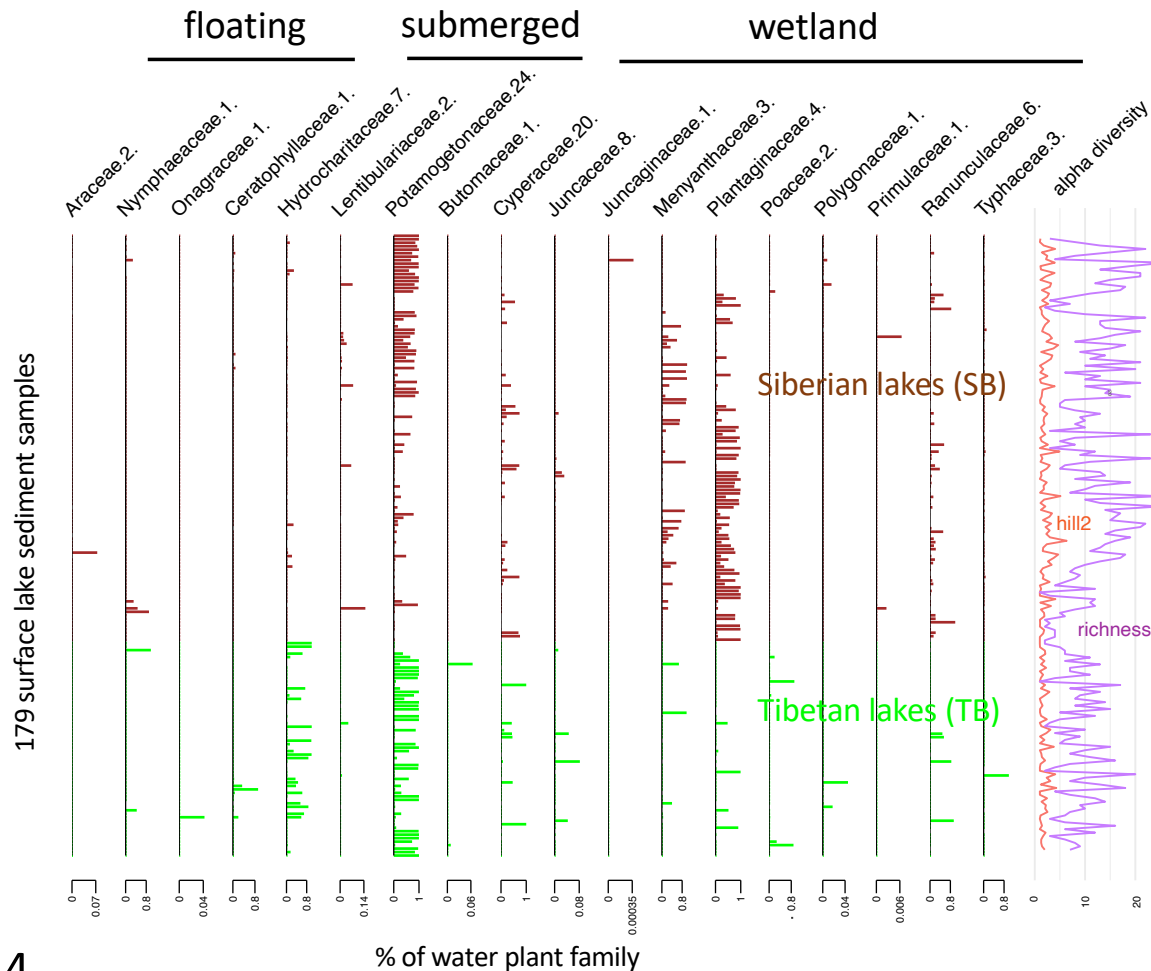
Water plant richness

Metabarcoding using P6 loop³
of lakes' sedimentary DNA

³ Taberlet et al. 2007, NAR



- 88 sequence types in 179 surface samples
- 18 water plant families



Highest relative influence on water plant richness:

July temperature

Conductivity

Lake depth

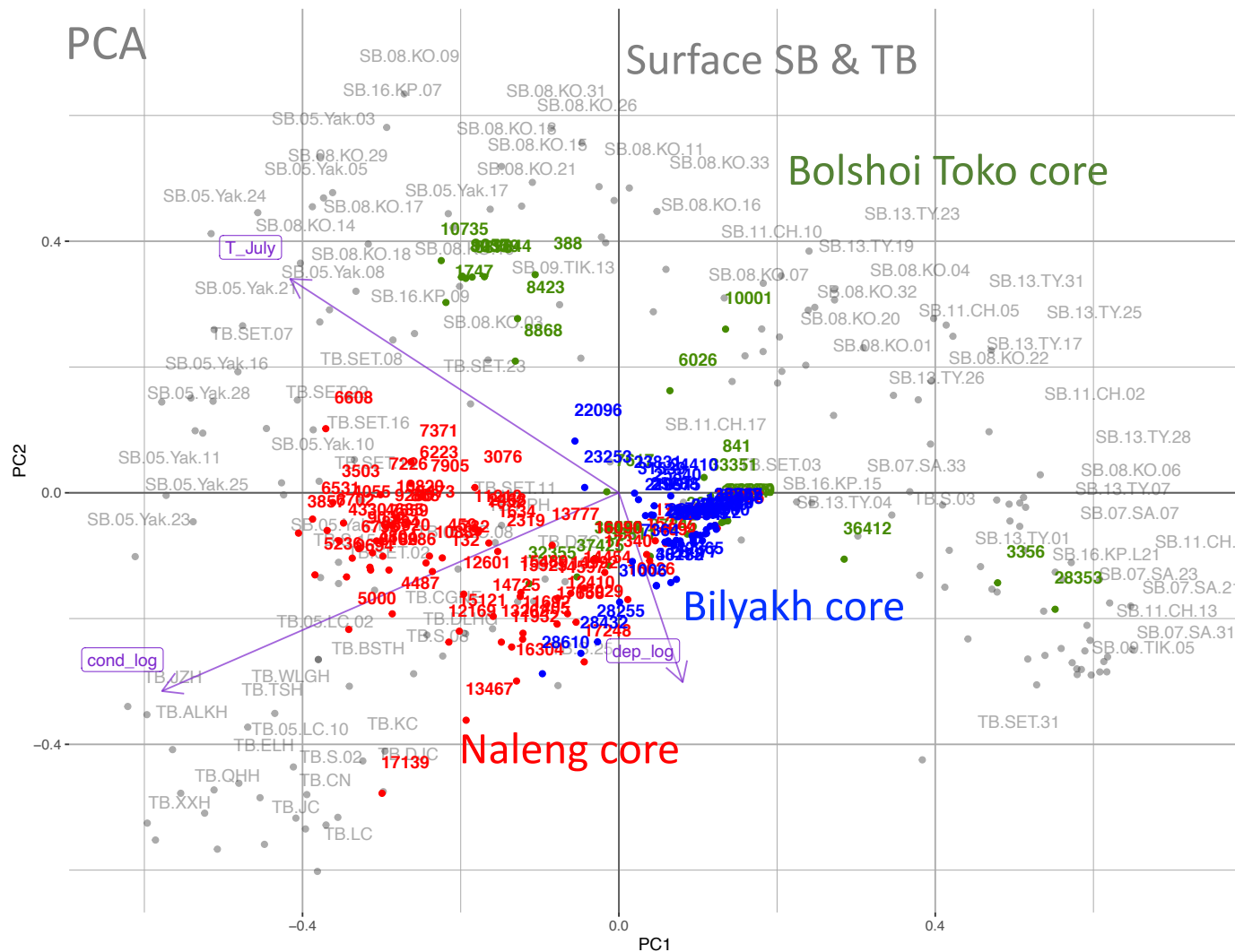
pH

Relative influence

Modern and past water plant composition



Core samples (ages are given) are plotted in the ordination of the modern data set



Variance in the water plant composition is explained by...

env. para	R ²	AdjR ²	p
all	0.154	0.139	0.001
unique proportions			
T July	0.063	0.058	0.001
cond	0.092	0.086	0.001
depth	0.016	0.010	0.028

Preliminary conclusions

- Temperature & conductivity have a stronger influence on water plant diversity (richness and composition) than lake depth.
- Past changes of water plant diversity are:
 - in **Bolshoi Toko** Lake mostly associated with temperature increase from late Plesitocene/Holocene transition
 - in **Bilyakh** Lake associated with lake depth variations
 - in **Naleng** Lake associated with variations in temperature and conductivity & strong increase in richness since Holocene

Further analyses will provide more information about water plant diversity changes at climatically sensitive and shallow Tundra lakes in Siberia.

