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TERENO TERRESTRIAL ENVIRONMENTAL OBSERVATORIES

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Dynamic growth responses of oak and beech to changing climatic and hydrological conditions in NE-Germany

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Introduction

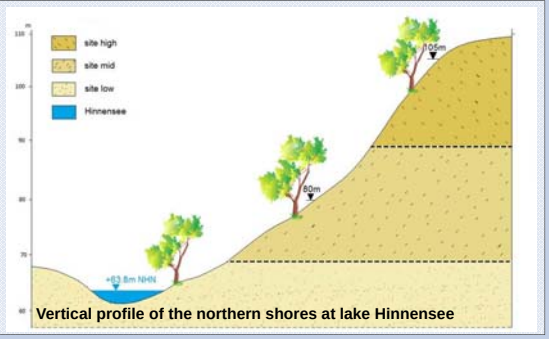
Dynamic water-level fluctuations have been identified for many lakes in **TERENO NE**. Instrumental data of lake levels are only available for the last 30 years, not long enough to examine long-term fluctuation patterns. Tree-ring widths are excellent natural archives but often contain a mixture of different signals. For a better understanding of this signal mix, trees were sampled along an **altitudinal transect at lake Hinnensee**.

Objective

➢ The main objective is to combine tree-ring widths and vessel measurements to reconstruct both the changing climate and lake level dynamics in historical times.

Study Site

Steep slopes at the northern shores of **lake Hinnensee**, Müritz National Park, NE Germany. Mature mixed forests of **oaks** (*Quercus spp.*), **beech** (*Fagus sylvatica*) and **Scotts pine** (*Pinus sylvestris*) as the dominant species.



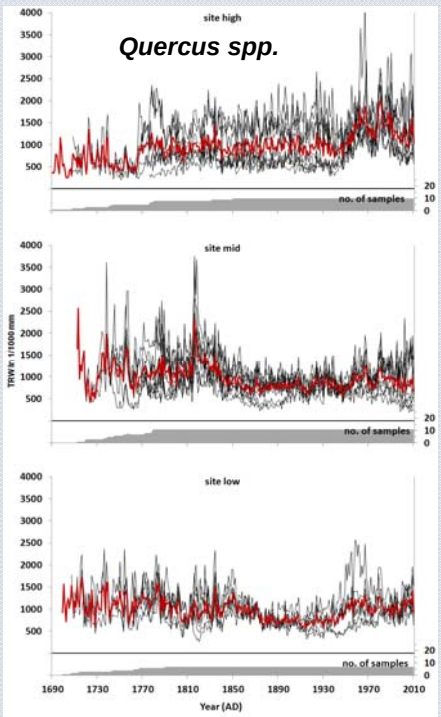
Vertical profile of the northern shores at lake Hinnensee

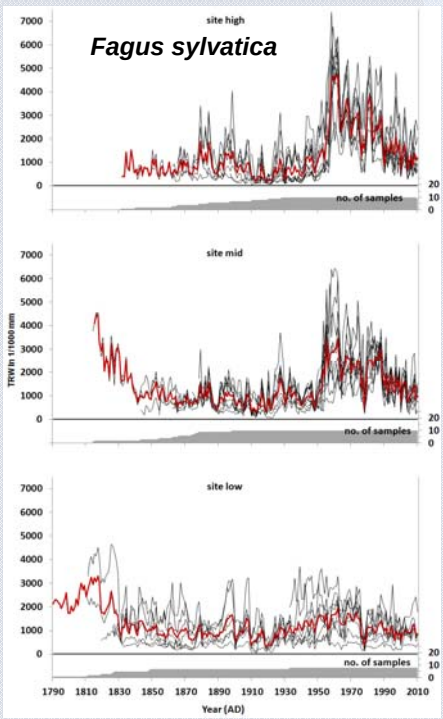
Methods

- Core samples of six trees per site (low, mid, high) were taken along a transect.
- Dendrochronological analyses of oak and beech resulted in tree-ring chronologies spanning at least the last 200 to 300 years.
- Measurements of **vessel lumen area** using the **new GFZ confocal scanning laser microscope system** and WinCELL software.

Results

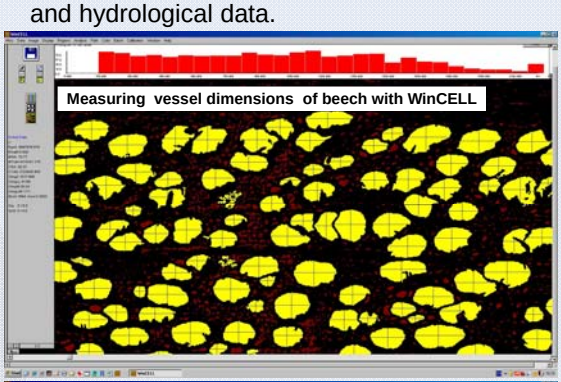
- 3 tree-ring width chronologies from each transect of ~300 years length for oak and ~200 years length for beech have been accomplished.
- Low- and high-frequency variations are visible throughout the centuries.
- At the high-elevation sites both species experienced strong growth increases during the mid-20th century (period of last lake level peak).

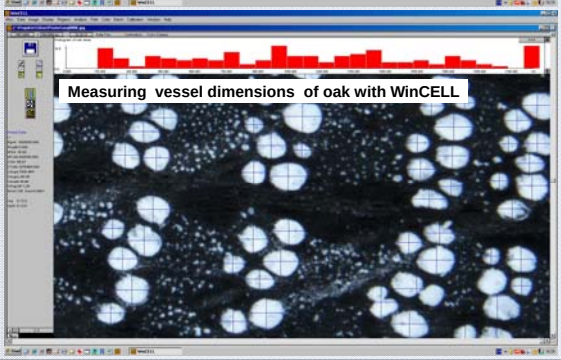




Next steps

- Measure parameters, e.g., total and average lumen area (TLA & ALA).
- Calculate indices, e.g., the first 10% lumen area (10% ALA) and 30 biggest vessels.
- Compare correlations of all series with climate and hydrological data.





Outlook

- Preliminary results indicate that trees at the three sites display different reactions towards climate and hydrological variations.
- Adding data on vessel dimensions will supply us with a more complete picture of the tree-growth reactions.
- Statistical analyses, e.g., spectral and moving correlations analyses, in conjunction with new data from our monitoring network, will help to separate the variations that are due to climate, hydrology and other forcing factors.
- Finally, high-resolution well-dated proxy-series will shed more light on the hydrological variations of the past.