

# Confocal laser scanning microscopy (CLSM) for long series of cell structure measurements in TERENO NE

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## Introduction

In TERENO NE strong hydrological dynamics are occurring but the reasons are unclear. Tree-ring width is a parameter often used in dendrochronology but in the lowlands of TERENO NE its correlation with climate and soil moisture is limited. Cell structure features can potentially be used as an additional biological archive to reconstruct environmental conditions. However, building long series of wood cell features has so far been highly time consuming. Our new method is presented as an efficient method to produce long chronologies of various cell parameters.

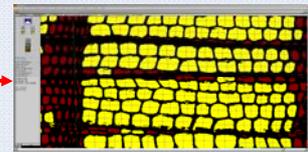
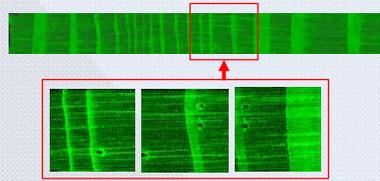
Therefore, the **OBJECTIVES** of the study are to:

- develop an efficient method to build long chronologies of different cell parameters, and
- examine the additional value of the cell structure measurements.



## Methods

CLSM in action



### Data analysis

- Measurement of total lumen area (TLA), lumen diameter (LD), cell wall thickness (CWT), average lumen area (ALA), cell number (CN).
- Calculation of the first 10% lumen area (10% ALA) and 30 biggest lumen area (30 MAX) to mean values, respectively.
- Application of Pearson's correlation to all series.

### Sampling

- 30 increment cores of 15 trees (*Pinus sylvestris*) for tree-ring width analysis.
- 10 cores of 8 selected trees for cell measurements.

### Lab work

- Sample preparation, cross-dating & measuring tree-ring width (TRW) in WinDENDRO.
- Digital imagery with CLSM directly from cores.
- Merging images in Adobe Photoshop.
- Cell measurements in WinCell.

## Results

- Similar trends in TRW data, TLA and CN
- Opposite trends in TRW data and ALA
- Wide rings are associated with many but smaller cells

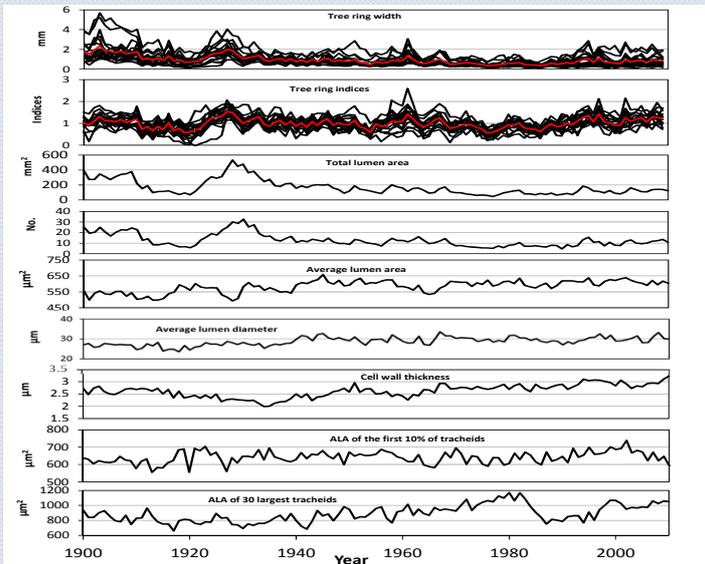


Fig. 1: Diagrams of tree-ring width and various cell structure parameters

Preliminary significant correlations between:

- ALA & ALD and Jul/Aug temperature
- TRW/Indices and Jul/Aug precipitation of both years
- May/Jun cloud cover of current year

- Significant correlation between TRW data and ALA, CN and TLA
- No correlation between TRW data and ALD, CWT, 10% ALA and 30 MAX

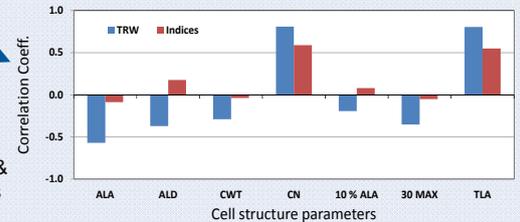


Fig. 2: Correlations between tree-ring width & cell structure parameters

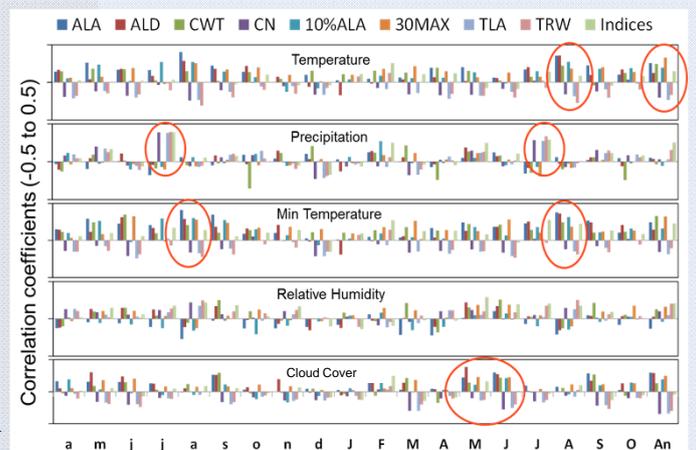


Fig. 3: Correlations between cell structures and climate parameters

## Conclusions

- The CLSM system helps to simplify the entire sample preparation & decreases the more laborious work of image acquisition.
- An efficient measurement procedure of wood anatomical parameters has been achieved and is currently being applied.
- More environmental information of approx. the last 500 years stored in wood anatomical structures of tree rings will be revealed.