Tree-ring chronologies in relation to past human and natural disturbances

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1. **Aim (for EnvEurope and LTER)**

Analyze of tree ring chronologies in relation to human and natural disturbances in order to identify trends of physiological growth.

2. **Research questions and Hypothesis (500 words)**

In boreal regions, trees grow annual rings of different characteristics depending on climate and anthropogenic disturbances. These deviations may be used to analyze historical climate variations or the influence of management practices.
Trees from the same region will tend to develop the same patterns of ring widths and/or density for a given period. These patterns can be compared and matched on individual rings for trees originated from different geographical areas but under similar climatic conditions. Following these tree-ring patterns from living trees back through time, chronological data series can be obtained, for the entire experiment area. With climate change models, it is possible to make predictions on trees growth and wood quality trends and highlight the consequences of present management activities on future of the forest.
Tree ring chronologies are built based on core samples taken from trees selected for the experiment, which are prepared for measuring the width and/or density by means of specialized equipment.
The main objective of the project is to gain knowledge on the influence exerted by the major disturbing factors on long term dynamics of growth in boreal forests. This is supported mainly by the significant impact of different pressure factors (land use type, climate fluctuations, silvicultural interventions, invasive species etc.) on forests.
The specific objectives are to study the natural site conditions and of distribution of forests in the research area and develop tree-ring chronologies, identify pointer years and limiting climatic factors for forest growth.

3. **Spatial and temporal coverage**

Mountain forests of spruce, silver fir, beech, pine etc., in European LTER sites.
Temporal coverage is only limited on the available meteorological data and the age of the sampled trees, but usually greater than 50 years.

4. Parameters used/needed* (if not only aquatic habitat are to be selected then the parameter group could be enlarged)

Parameter group (theme)	**Selected parameter**	**Details about the parameter**	**Should be taken from existing data (yes/no)**	**Feasibility/constraints regarding existing data**	**Should be recorded in field (A5 work) (yes/no)**	**feasibility/ constraints regarding field sampling**

1) Climate and physical variability	Monthly mean air temperature	Data recorded according to WMO standards	y	n	y	n
	Monthly precipitation	Data recorded according to WMO standards	y	n	y	n
	Tree-rings properties	Total width, earlywood and latewood width, density	y	n	y	n
3) Structure and function of the ecosystems, communities and populations	Type of forest	Species composition, age distribution	y	n	y	n
4) Human population and economy	Management intensity, land use change		y	n	y	n

5. METHODS USED

Standard dendroclimatology method (Cook and Kairiukstis 1990; Cook, Krusic et al. 2005)

6. EXPECTED RESULTS

Highlight the trend of physiological growth of trees in different forest conditions.
See the past recorded disturbances in terms of frequency and intensity.
Infer the consequences of future changes in climate change and management policy on forest status.

7. REFERENCES

Cook, E. R. and L. A. Kairiukstis (1990). Methods of dendrochronology. Applications in the environmental sciences. Dordrecht, Olanda, Kluwer Academic Publishers**:** 123-132.

Cook, E. R., P. J. Krusic, et al. (2005). Program Arstan, a tree ring standardization program based on detrending and autoregressive time series modeling, with interactive graphics. Palisades NY, SUA.