Project title

Effects of meteorological parameters and air pollution on trees growth in EnvEurope forest sites.

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1. Aim

The aim of the project is to show the level and differences in effects of meteorological parameters and air pollutants on trees growth in relation to climatic zones and altitude at the European scale.

2. Research questions and Hypothesis

Climatic conditions are the most important natural factors affecting the tree growth. These natural factors are permanently stored in the structure of the created biomass and so trees monitor the state of the environment in the structure of their rings (Fritts 1976). Therefore, it is possible to use the method of the dendrochronological analysis for modeling the climatic environment influence (Rybníček et al. 2009). The most significant climatic factors that can even cause damage to wood are mainly extreme fluctuations of temperatures, insufficient precipitation, snow, wind and frost (Schweingruber 1996). Also anthropogenic pressure (air pollution) is a reason of disturbances in trees growth (Tendel & Wolf 1988, Krupova 2002, Staszewski et al. 2008, Rybníček et al. 2009). The global warming and weather anomalies occurring more often can in the future affect forest ecosystems which can manifested in the reduction of ecosystem productivity, extinction or translocation of species more vulnerable to climate fluctuations, which can also affect woodworking industry.

The hypothesis can be tested:

Weather conditions and air pollution influence tree growth across Europe and this effect depends on climatic conditions, site altitude and tree species.

3. Spatial and temporal coverage

Forest across Europe

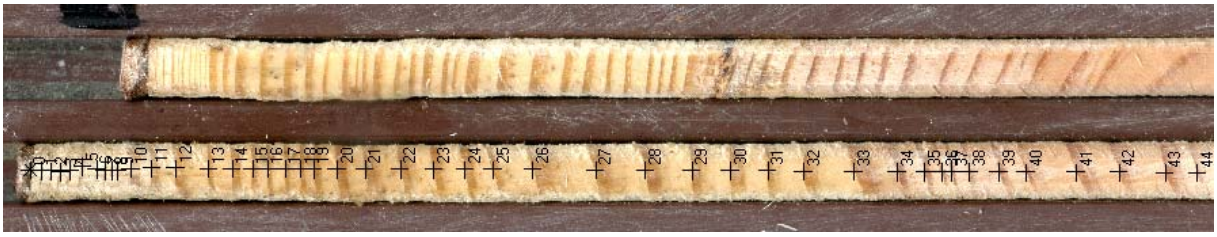
At least 80 - 100 years of past data

4. Parameters used/needed

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	Annual/month mean air temperature	standard meteorological method; annual/month mean values of about 100 years, where possible	Yes and completed with data gathered in historical survey	no problems	no	
	Annual/month precipitation sum	standard meteorological method; annual/month mean values of about 100 years, where possible	Yes and completed with data gathered in historical survey	no problems	no	
2) Biogeochemistry data	Mean annual SO_2, NO_2, O_3 (or AOT40) concentrations	Data comprising mainly the period of industrial development and "post-industrial" period (last 20 years)	yes	Additionally EMEP modeled data can be used	no	
	Annual sulphur and nitrogen deposition	In bulk and where available in throughfall deposition	yes	Additionally EMEP modeled data can be used	no	
	Uptake of tree bores	Samples should be taken from 6 trees of the same species possibly in the same age	no		yes	forest-forming species representative for a given site should be selected
	Measurement of radial increments	The best method of the measurement should be selected	no		no	
3) Structure and function of the ecosystems, communities and populations	Tree species	Selection of tree species should be discussed				
4) Human population and economy	Forest management	Different activities carried out in forest like felling, skidding, melioration, stand reconstruction should be taken into consideration	Yes or should be completed	none	no	

5. METHODS USED

1) Collecting data on annual/month mean air temperature and annual precipitation sum.
2) Collecting data on the level of air pollutants.
3) Uptake of wood samples by the increment borer.
3) Measurement of radial increments on scanned bores using CooRecorder 5.3 i CDendro5.3 programmes.



6. EXPECTED RESULTS

Recognition of ecosystem development conditions.
Demonstration of abiotic factors and anthropopression effects on trees growth.
Use of the gathered data to explain in details (may be in other projects) causes of development disturbances (e. g. low precipitation level in July of previous year, extraordinary weather events, high level of air pollutants in growing season, etc.).

7. REFERENCES

Fritts 1976. Tree Ring and Climate. London, New York, San Francisco, Academic Press: 567.

Krupova M., 2002. Dendroecological study of spruce growth in regions under long-term air pollution load.Journal of Forest Science, 48: 536–548.

M. Rybníček, P. Čermák, T. Kolář, E. Přemyslovská, T. Žid . 2009. Influence of temperatures and precipitation on radial increment of Orlické hory Mts. spruce stands at altitudes over 800 m a.s.l. Journal of Forest Science, 55, (6): 257–263.

Schweingruber 1996. Tree Rings and Environment Dendroecology. Bern, Stuttgart, Vienna, Birmensdorf, Swiss Federal Institute for Forest, Snow and Landscape Research: 609.

Staszewski T, Kubiesa P., Szdzuj J., Łukasik W. (2008). Response of pine stands to changes in environment pollution in the vicinity of "Konin" aluminium smelter Phytopedon (Bratislava), Vol. 7, 1, p. 180–185.

Tendel J., Wolf K., 1988. Distribution of nutrients and trace elements in annual rings of pine trees as an indicator of environmental changes. Experientia 44 975-980.