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Growth Responses of Norway Spruce (Picea abies (L.) Karst.) to Climate in the Central Part of the Českomoravská Upland (Czech Republic)

Kolář T. – Rybníček M.

Goal

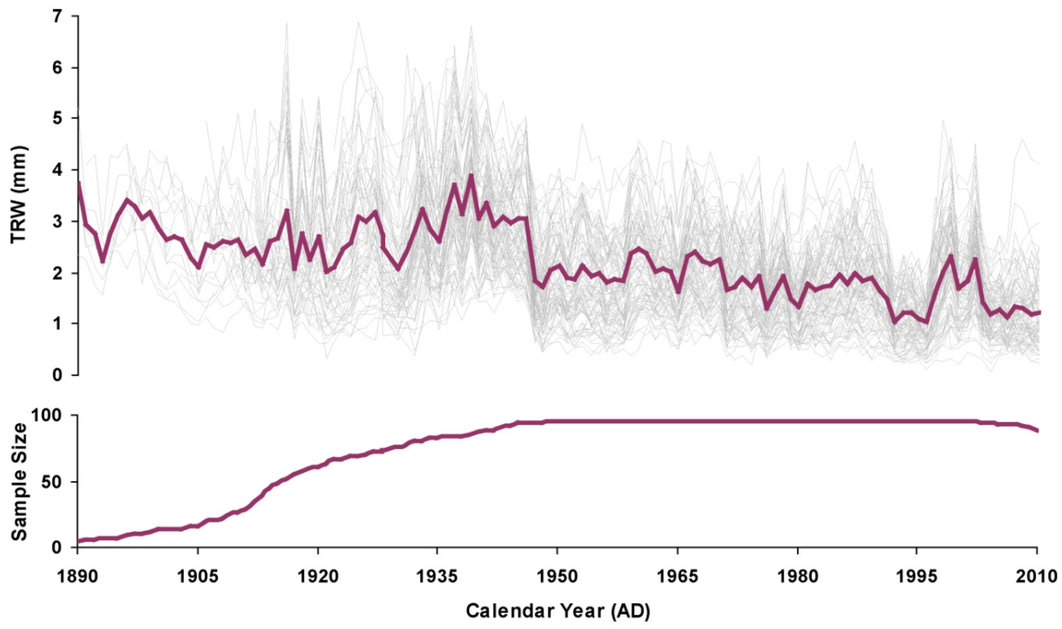
The aims of this study were to analyse the dynamics of radial growth of Norway spruce in the central part of the Českomoravská Upland in the last fifty years, for which there are relevant climatic records available, and to identify the growth response to climate.

Material and methods

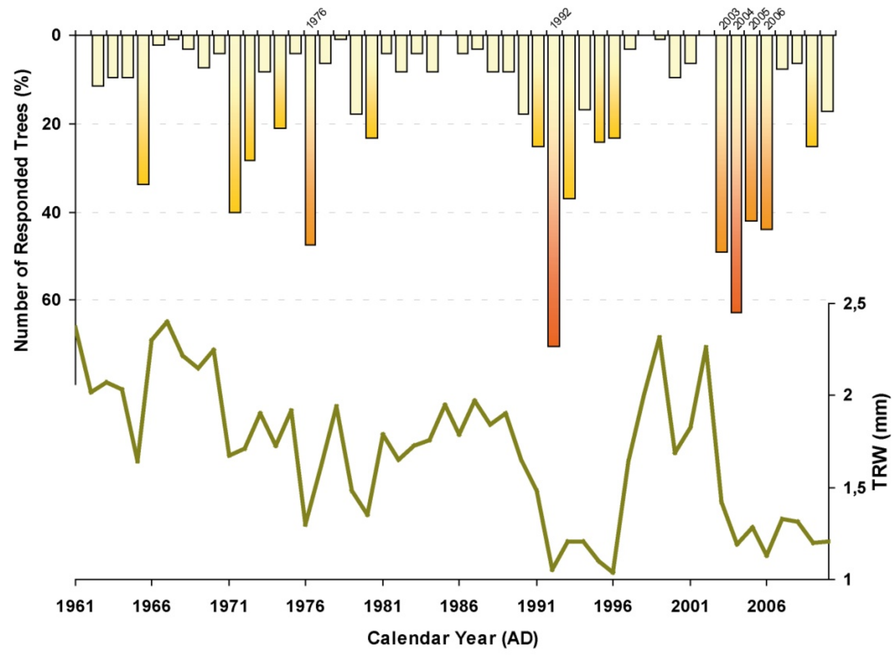
The research was conducted in ten selected forest stands with predominance of Norway spruce in the central part of the Českomoravská Upland near Herálec municipality in 2011. The stands were aged from 73–116 and were located at altitudes from 680–779 m a.s.l. 20 samples were taken in each of the locations for tree-ring analysis. The samples were processed using dendrochronological applications (PAST4, ARSTAN, DendroClim). We analysed negative pointer years.

Results

The regional tree-ring chronology shows two periods of strongly reduced increment: 1992–1996 and from 2003 to the end of the analysed period. Years with the lowest increments (1965, 1976, 1980, 1992, 1996, 2004, and 2006) were confirmed by the analysis of negative pointer years.

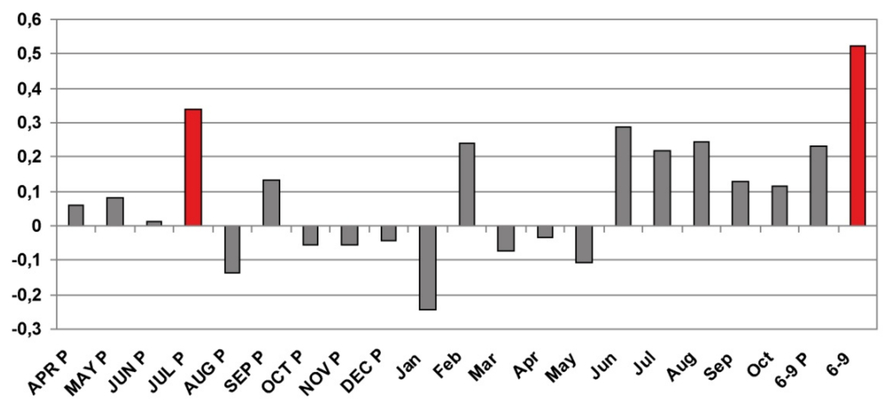


Tree-ring chronology from Českomoravská Upland near Herálec

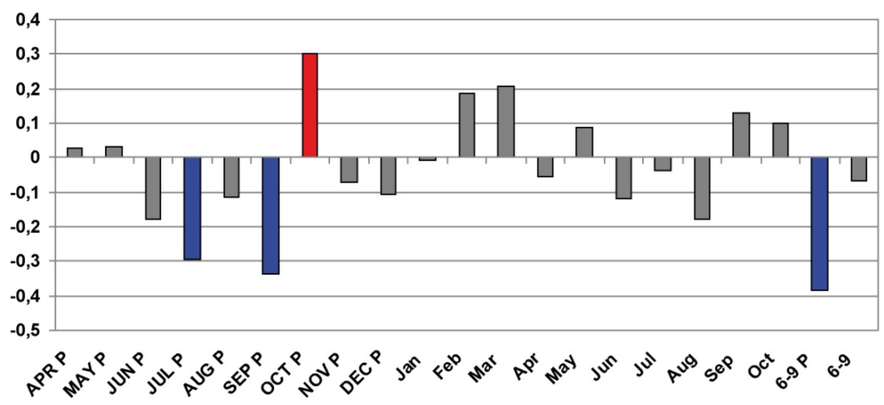


Negative pointer years for the period 1961–2010

The correlation of tree-ring width with monthly precipitation is positive and statistically significant for July of the previous year and for the entire summer period from June to September of the current year. The correlation of tree-ring width with mean monthly temperatures is negative and statistically significant for July and September of the previous year and positive and statistically significant for October of the previous year. Negative correlation was also found for temperatures of the entire summer period from June to September of the previous year.



Values of correlation coefficients of residual index chronology and average month precipitations. Red highlighted values are significant (α = 0.05).



Values of correlation coefficients of residual index chronology and average month temperatures. Blue highlighted values are significant (α = 0.05).

Conclusion

The results of dendrochronological analysis have confirmed our hypotheses: we found mainly positive correlations of summer sums of precipitation and negative correlations of summer temperatures with the tree-ring width.
The results of the analysis of negative pointer years show two most marked drops of growth curves – in 1992 and 2004.

Acknowledgement

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