CLIMATIC SENSIBILITY OF SPRUCE IN RODNA MOUNTAINS

Timiș-Gânsac Voichița*

* University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: timisvoichita2004l@yahoo.com

Abstract

In this study the analysis of correlation between meteorological parameters and chronologies was performed both for individual monthly values (from June precedent year to August current year of ring formation) and seasonal values: pON (previous October - November) and II (current June - July). Related to the thermal regime, positive and statistically significant are current growing season temperatures, respectively in June (0.40) and July (0.33). Previous autumn temperatures are positively correlated with radial growth, but at the limit of statistical significance (October: 0.23 November: 0.24).

Level of rainfall in February has a positive influence on radial growth processes, but at the limit of statistical significance.

Key words: Spruce, radial growth, climatic sensibility, response function model.

INTRODUCTION

This paper addresses issues of correlative relationship between meteorological factors (temperature and rainfall regime) and radial growth processes, expressed by growth indices, both in intensity and significance of the relationship and in terms of temporal stability. Old forest ecosystems, less anthropogenically disturbed by timber extraction, is an opportunity to quantify the relationship between radial growth and changes in meteorological parameters, both in terms of statistical relationship and its temporal stability. Study area falls in relation to regional climate in the region of mountain climate, elementary topoclimate mountain ridges, the slopes with the dominant northern and southern aspect.

In recent years there is a deepening of research on dendrochronology approached the issues of tree rings structural changes induced by extreme climatic factors (Popa et al., 2006; Kern, Popa, 2008), dendrochemistry studies (Kern et al., 2009) or xylology (Semeniuc, Popa, 2009; Popa, 2009). Bouriaud and Popa (2009) highlight the significant influence of precipitation regime in the radial growth of spruce in the area of Vintileasa - Vrancea.

MATERIAL AND METHOD

The choice of experimental plots for Spruce provides both a spatial representation and assess of the altitude effect on tree response to changes in meteorological factors. The effect of altitude, as influence factor on tress

sensitivity to climate was quantified by an altitudinal transect on Pietrosul Rodnei Mts..

Thus, the dendrochronological series for spruce from timberline of Pietrosul Rodnei (PTRS) in addition to specific climatic pattern of the high mountain include the effect of the study area (Fig. 1).

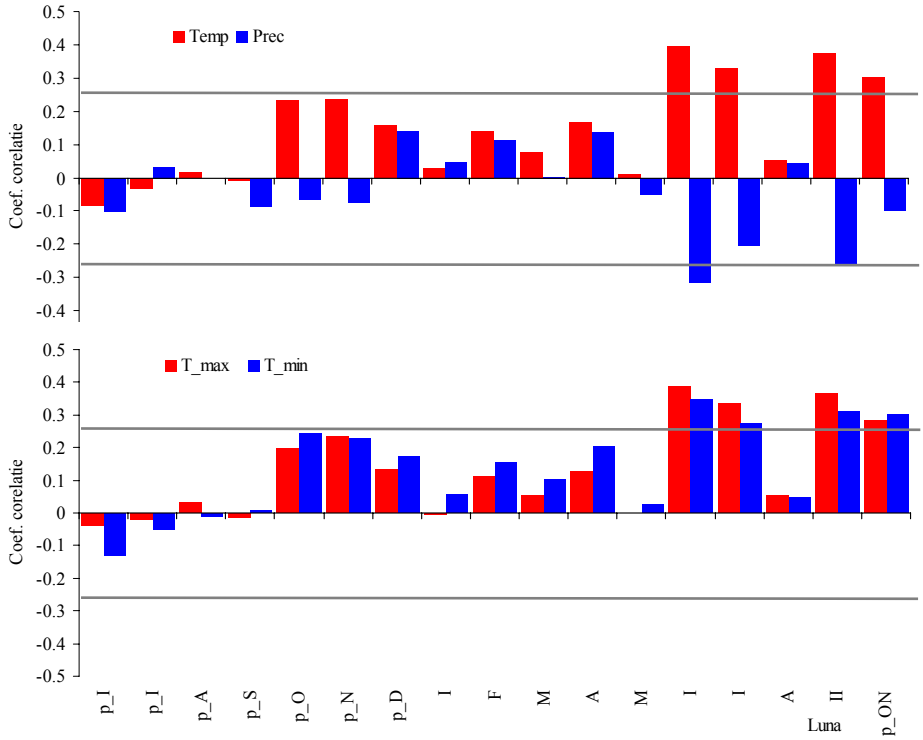

Fig. 1. Correlation between climate factors and growth index for spruce (PTRS) from Piatra Neagră

Related to the thermal regime, positive and statistically significant are current growing season temperatures, respectively in June (0.40) and July (0.33). Previous autumn temperatures are positively correlated with radial growth, but at the limit of statistical significance (October: 0.23 November: 0.24). Unlike the spruce chronologies from the eastern part of Rodnei Mountains (LALB, BILA and PUTA) the growth of spruce from Pietrosul Rodnei is positively correlated with thermal regime and rainfall in the dormant season (December-April). Positive influence of the thermal regime of the period from October to December and February to March is more evident when the mean minimum temperature is considered.

RESULTS AND DISCUSSION

Passing to response function the temperature signal of dendrochronology series is obvious (Fig. 2). Level of rainfall in February has a positive influence on radial growth processes, but at the limit of statistical significance. As regards the thermal regime, the model response functions show positive correlation values in November (previous season), June and July of the current growing season. Statistically significant negative correlation of June rainfall regime calculated by the method correlation is insignificant when applying the method of response functions.

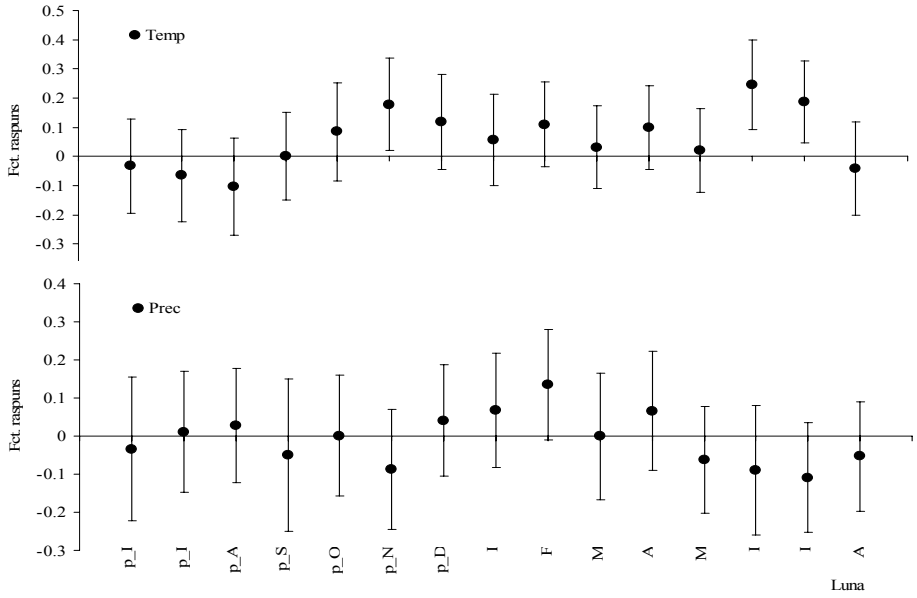

Fig. 2. Response function for spruce (PTRS) from Pietrosul Rodnei – Piatra Neagră

Variance explained by climate model response functions estimated by regressive model is 42%. High correlation between real growth indices and those estimated by the model is visible both graphically and statistically (0.64). It also notes correctly modeling of growth processes with significant reduction in the period 1947-1949, which in previous cases was overestimated by the climate model.

CONCLUSIONS

Analysis of current state of research in Romanian dendrochronology studies highlight the need to deepen the networks and transect of dendrochronological series. Reconstitution of the thermal growing season is

a chronology of Rodna relevant to intra-annual variability like high-frequency climate signal.

In conclusion dendrochronological series for spruce developed for the northern part of Rodna Mts. incorporating both a general Northern Hemisphere climate signal and specific influence of the Carpathian microclimate.

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