DENDROCHRONOLOGICAL SERIE FOR NORWAY SPRUCE FROM PIETROSU MASSIF – RODNA MOUNTAINS

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Abstract

In this paper, master dendrochronological series were elaborated for Norway Spruce from Pietrosu Massif – Rodna Mountains, utilizing increment core from 22 trees. Calculations of statistical parameters was obtained with the ARSTAN ver. 41. The index series has 141 years covering the period between 1867 and 2007.

Elaboration of dendrochronological series from Norway Spruce in the Pietrosu massif – Rodna Mountains contributes to dating, reconstruction of local an regional climate.

Key words: *Norway Spruce, tree ring, master dendrochronological, dendrochronological series*

INTRODUCTION

Tree growing in an area with seasonal variations of climate (winter-summer alternation or the humid season-dry season) is characterized by a single growth per vegetation period, namely the growth ring. The growth ring varies from one year to another (in the case of annual variation of the climate) or from one vegetation period (season) to another (in the case when the seasonal variation of climate is longer or shorter than a year, as far as both its width and its structure and density of wood are concerned.

The annual tree ring constituted an archive a real database, regarding the secular and multi-secular variation of the environment factors at both global and mezzo-and micro scale levels.

MATERIAL AND METHOD

The study sites are situated in the Pietrosu Massif – Izvorul Alb at 1100 meter altitude (fig.1). The samples were collected from total 22 trees of Norway Spruce. The cores were extracted from 1,30 m height, using an increment borer. Each core was numbered and coded as PITB211, PITB212, PITB422. The sample were measured to the nearest 0,01 mm using digital positiometer.

Cross dating was verified and corrected with computer program COFECHA.

RESULTS AND DISCUSSION

Statistical parameters of dendrochronological series were obtained with the program ARSTAN ver. 41 (table 1).

Table 1

The statistical parameters of dendrochronological series PITB

Sample	First year	Least year	Number of year	Radial growth	Standard deviation	Sensibility	Autocorrelation
PITB011	1921	2007	87	2,3	0,9	0,21	0,75
PITB012	1890	2007	118	2,7	1,21	0,20	0,8
PITB021	1889	2007	119	2,29	1,55	0,17	0,87
PITB022	1888	2007	120	2,41	1,69	0,18	0,79
PITB031	1895	2007	113	2,28	1,89	0,21	0,91
PITB032	1887	2007	121	2,8	1,79	0,21	0,91
PITB041	1890	2007	118	2,56	0,95	0,16	0,86
PITB051	1868	2007	140	1,42	1,31	0,22	0,89
PITB052	1881	2007	127	1,63	1,56	0,17	0,78
PITB061	1876	2007	132	1,48	1,26	0,23	0,87
PITB062	1874	2007	134	1,58	1,4	0,26	0,8
PITB071	1903	2007	105	2,57	1,44	0,23	0,82
PITB072	1936	2007	72	2,57	2,16	0,23	0,81
PITB081	1908	2007	100	4,49	0,73	0,21	0,78
PITB082	1886	2007	122	2,19	1,087	0,19	0,86
PITB091	1928	2007	80	3,03	1,84	0,23	0,68
PIBT92	1933	2007	75	2,65	2,14	0,22	0,85
PITB101	1902	2007	106	2,73	1,8	0,23	0,86
PITB102	1887	2007	121	2,23	1,2	0,21	0,89
PITB111	1932	2007	76	3,61	2,28	0,17	0,85
PITB112	1922	2007	86	3,05	1,56	0,18	0,87
PITB121	1914	2007	94	2,46	1,68	0,20	0,87
PITB122	1907	2007	101	3,05	1,33	0,20	0,79
PITB131	1911	2007	97	2,49	1,47	0,17	0,94
PITB132	1910	2007	98	3,09	1,06	0,16	0,80
PITB141	1934	2007	74	2,82	0,99	0,16	0,68
PITB142	1948	2007	60	3,91	1,42	0,16	0,65
PITB151	1898	2007	110	3,07	2,0	0,20	0,90
PITB152	1910	2007	98	3,71	1,93	0,20	0,86
PITB161	1885	2007	123	2,58	1,37	0,22	0,78
PITB162	1904	2007	104	2,84	1,83	0,22	0,89
PITB171	1891	2007	117	2,44	1,2	0,19	0,83
PITB172	1950	200e7	117	2,55	1,35	0,21	0,80
PITB181	1948	2007	58	3,73	1,78	0,16	0,86
PITB182	1948	2007	60	3,56	2,02	0,17	0,88
PITB191	1945	2007	63	3,29	1,43	0,15	0,85
PITB192	1942	2007	66	4,56	1,45	0,18	0,73
PITB201	1895	2007	113	2,24	1,62	0,17	0,95
PITB202	1894	2007	114	2,04	1,66	0,20	0,83
PITB211	1867	2007	141	2,36	1,66	0,22	0,83
PITB212	1923	2007	85	3,15	1,5	0,24	0,72
PITB221	1932	2007	76	3,04	1,44	0,23	0,82
PITB222	1872	2007	136	1,86	1,8	0,26	0,84
Maximum	**1970**	**2007**	**141**	**4.56**	**2.28**	**0.26**	**0.94**
Mean	**1907**	**2007**	**102**	**2.71**	**1.53**	**0.20**	**0.83**
Minimum	**1867**	**2007**	**58**	**1.42**	**0.73**	**0.15**	**0.65**

The dendrochronological time spain is the 141 years, the radial growth variation between 0,73-2,28 with a mean 1,54. Sensibility is 0,157-0,269, with mean value 0,205 (tree PITB 062). The value of autocorrelation are between 0,65-0,94 with a mean 0,83 (minimum value appear at tree PITB142, and the maximum value at tree PITB131).

This curve is significant to a Norway spruce tree in open field (fig.1).

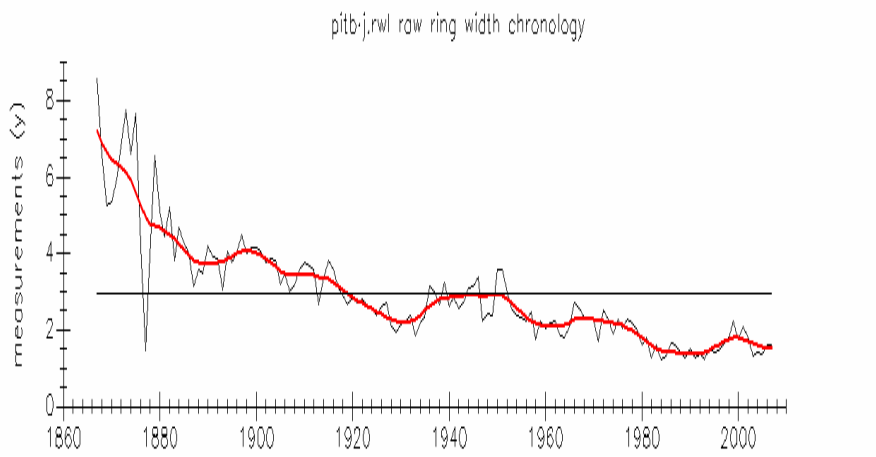

Fig.1 Average growth curve from dendrochronological Pietrosu – PITB

Rbar is computed as the average Pearson correlation, of all pairs that share at least 25 years of data, within a given window. Fig. 2 presents coverage of time by the sequences forming the chronology.

The rbar only changes when sample replication changes. The Rbar value obtained was 0,175.

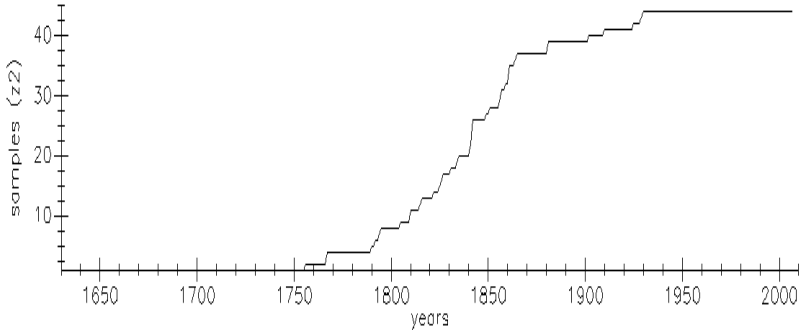

Fig. 2 The sample replication

Dendrochronological series is significant with year 1950, because EPS value obtained with ARSTAN program is 0,891 (fig. 3).
Expressed Population Signal (EPS) is a similar parameter for the agreement between trees or common variance in relation to total variance. An EPS over 0.85 is considered a generally acceptable threshold for reliable chronologies.

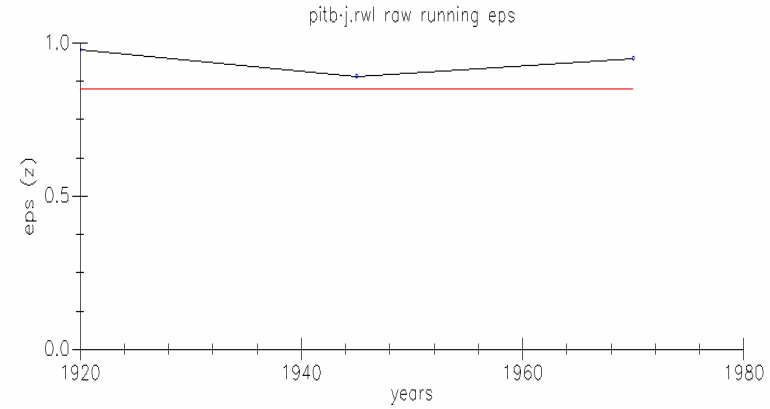

Fig. 3 Statistic analysis of the dendrochronological series significant through EPS

To establish dendrochronological series was applied smoothing spline.

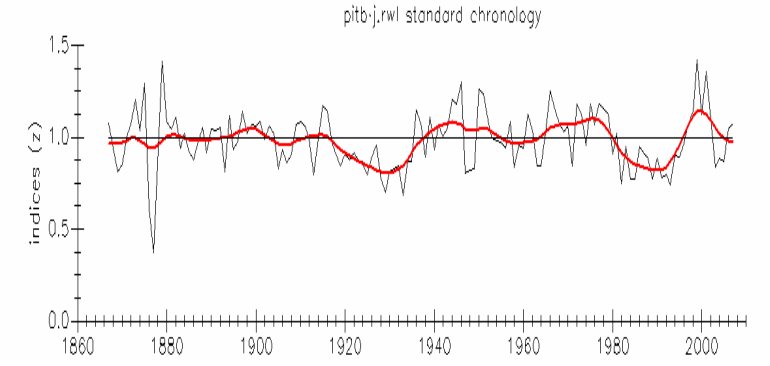

Fig. 4 Dendrochronological series for Norway spruce- PITB

The index series has 141 years covering the period between 1867 and 2007.

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