стем комбинируются в сложные гибридные образования, классификацию которых следует осуществлять по соотношению площадей трех основных типов экосистем.

При экологическом нормировании атмосферных загрязнений по реакции древесной растительности, следует иметь в виду практическую невозможность установить единые для какой-либо значительной территории нормативы загрязнения по отдельным веществам. Для практического применения нормы должны быть локально-индивидуальными. Такое положение имеет место потому, что реакция на загрязнение одного и того же вида древесных растений в разных экосистемах будет различной вследствие их разной самоочищающей способности, кроме того на реакцию влияет сопутствующий данному загрязняющему веществу фон, который так же не бывает одинаковым, даже у предприятий одной отрасли.

Предельно-допустимые нормы загрязнения воздуха, определенные по реакции древостоев ели европейской являются значительно более жесткими (в 5-10 раз) , чем нормы санитарно-гигиенические.

UDC 634.942+551.583

Bitvinskas T.,
Vitas A.

CORRELATION BETWEEN THE RADIAL GROWTH OF SCOTS PINE AND NORWAY SPRUCE AND CLIMATE IN KAZLU RUDA FORESTS, LITHUANIA

Vytautas Magnus University, Kaunas Botanical Garden, Kaunas

The aim of our research is to clear up the impact of climate in various periods of the XX century, because from this period already exits more or less reliable meteorological data.

Was used the tree-rings chronologies of Scots pine (Pinus silvestris) and Norway spruce (Picea excelsa) taken in experimental plots in mature Kazlu Ruda and Dubrava forests and meteorological data (precipitation and air temperature) of Kaunas meteorological station from 1892 year. Were used hydrothermal indicators:

1. ThM - hydrological year average temperature (IX-XII + I-VIII),
2. VhM - hydrological year precipitation,
3. O_1 - hydrothermal indicator=thM/VhM,

4. O_3 - hydrothermal indicator=$(V_3+2V_2+3V_1+4V_0)*(t_3+2t_2+3t_1+4t_0)*t_0$. V_3, t_3 are values of hydrothermal indicators before 3 hydrological years, V_2, t_2 before two and V_0, t_0 of the past hydrological year.

Was counted correlation coefficients between the radial growth indexes of Scots pine and Norway spruce and hydrothermal climatic indicators. Scots pine has been researched in vacciniosum, myrtillosum, myrtillo-oxalidosum and sphagnosum and Norway spruce in Piceetum vacciniosum, myrtillo-oxalidosum and sphagnosum forest types (stands).

Hydrological year air temperature and indicator O_1 shows more reliable positive correlation in dry pine forests (0.14-0.26) and in dry fir-grooves stands with O_1 correlation is 0.25. In wet stands there are very low correlation. Were found 8-10 the radial growth rhythms, from 4 to 24 years length (common to a 9-13 years) and correlation were also counted with them (Fig. 1).. The main conclusion, which could be formulated from a correlation analysis between hydrothermal indicators and the radial growth in Lithuania is, that in spite of an ecological optimum of a XX century, the conditions of the tree-rings formation, were not similar. It is known, that Picea excelsa, Pinus silvestris, Quercus robur and other positively react to a higher air temperature with enough moisture. In such periods, in 1931-1965, there were a positive correlation with complex hydrothermal indicators. In optimal years for the radial growth, indicator O_1 is about 1 (O_1 shows the relation of the air temperature and precipitation in present years).

Positive correlation are in the middle of the XX century from 1940 to 1980 years. In the beginning and in the last decennium of this XX century between the radial growth of conifers and hydrothermal indicators dominates a negative correlation.

The climatic differences depending on a geographical regions could be illustrated comparing Scots pine and Norway spruce taken from Kaunas district and Vaisnoriske (Aukstaitija National Park) correlation with climate. In 1977-1991 years period annual rings of Scots pine, growing in Vaisnoriske, has good correlation with January-April temperature (0.39-0.80) and with January and February precipitation (0.43-0.58). Norway spruce has a positive correlation with June-July (0.27-0.37) and a negative - August and September (-0.29- -0.36) air temperature. The radial growth Scots pine in Kaunas has also a positive correlation with January-April air temperature (0.44-0.69). Norway spruce in Kaunas has a higher correlation with January-April air temperature (0.21-0.37) (in Vaisnoriske they are smaller). Norway spruce with January precipitation positively correlates only in Vaisnoriske. There are main differences between tree-rings growth reaction to the precipitation in June-August period in Kaunas and Vaisnoriske (in Vaisnoriske they are smaller).

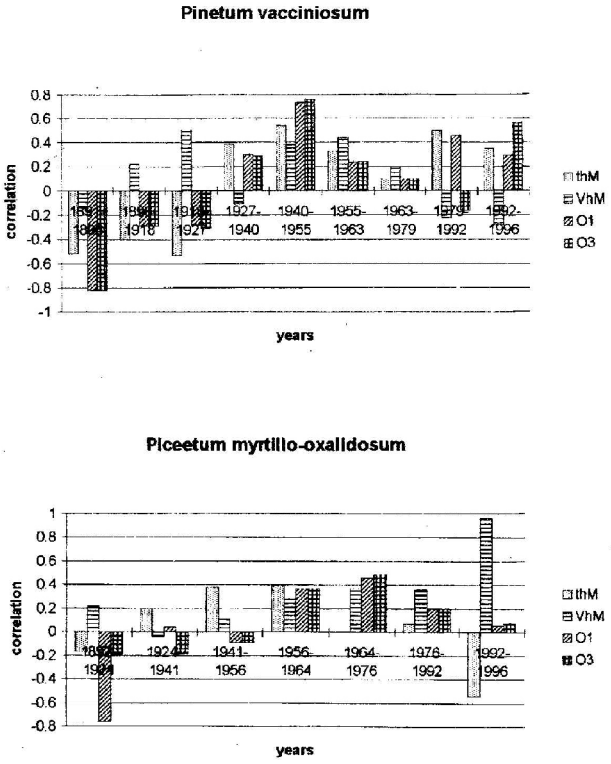

Fig. 1. Correlation between complex hydrothermal indicators and the radial growth of Scots pine in vacciniosa and Norway spruce in myrtillo-oxalidosa forest types (stands)

The main conclusions of the research are:

1. The big fluctuations of the tree growth from the 5 decennium is under the control of a bigger fluctuations of the Solar activity.
2. In 1989-1991 years there was the maximum of the 22 years Solar activity. In this period tree-rings were wide.

3. From 1992 to 1996 in fir-grooves and pine forests were narrow rings. In 1996 years also it was a minimum of the Solar activity (1.8 W) and in 1997 years the Solar activity began to rise (begins a new 22 years Solar activity cycle).
4. The periods of a narrow tree-rings often coincides with cold winters (for example in 1940-1942, 1954-1956, 1985-1987 years), but in 1992-1996 period were extreme warm winters in 1989-1993, 1995 years, warm springs (1994) and extremely hot summers (1992, 1994). In spite of a favor warm winters, due to a summer droughts, the ecological situation was extremely unfavour for trees (also in winters the insects could survive, for example Ips typographus).
5. Small correlation of a long-term period shows, that in some periods radial trees growth is stimulated or limited by a different climatic factors.
6. The climatic extremes of the past decennium could be a new climatic change with very series consequences to a forest and to a country economy. If it is due to a powerful natural cycle, which could depend on an intensive growing Solar activity, it is under the prognosis.
7. In all cases there is a necessary climatic and forests monitoring. Usual methods could prognosis the climatic extremes and its influence in the near future.