PART II

REGULARITIES OF PHENOMENA IN GROWTH OF PINE AND OTHER CONIFERS OVER VAST TERRITORIES OF THE NORTHERN HEMISPHERE TIME AND SPACE SERIES DYNAMIC

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The research of the last 5, 6 years which was referenced in works 1,2 and 3 (see Bibliography Reference at the end), leads to the following conclusion: dendroclimatological research which is grouped by profile, or by specific territories in space, permits the extrapolation of time and area which are pronounced for both positive and negative extremes. These phenomena are sometimes referred to as climatic optimums and pessimums.

Concise models of solar activity exhibiting 11, 22, 44, and 88 year cycles, (referenced in Papers 3 and 4, see Bibliography) and their correlation to correspondent time periods of radial increases in trees, indicate expediencies in performing such correlations (refer to Paper 4, Bibliography). During the periods of the certain types of phases of solar activity, the concentrations of optimum and pessimum increments in trees are statistically reliable. The increments, themselves, can, of course, differ entirely in their degree of pronouncement and by the duration of growth, dependent on geographic region, the conditions of growth location, tree species, and degree of exposure and mountain altitude.

Dendroscales, primary dendrochronological material compiled at the Kaunas Dendroclimatochronological Laboratory, as well as secondary research sources, literature on dendroscales were used for experimental research. The work from the Arizona Tree Ring Laboratory and the S.G.Shijatov Laboratory was the predominate secondary source (see Papers 5, 6, and 7 in the Bibliography).

On the basis of this material, dendroprofiles were developed as follows:

- the northern expanse between 30° and 60° latitude of the North American continent;
- Western longitudes of 110° to 120° in the West;
- Western longitudes between 70° and 85° in the East;
- in Europe along longitudes of 30° and 58° to 60°, reaching nearly 70° in the North.

The methodology developed by Dr.Teodoras Bitvinskas at the Kaunas Dendroclimatochronological Laboratory was adapted to the computer technology, the M-6000 by programmer, A.Zokaitis. Thus, all the data of interest was retabulated. In the final summation one row of the data is extracted for each dendroscale, the point of observation. The generalised data on the increases of the trees are distributed over 11, 22 and 44 year cycle phases of solar activity. The categories of increment are defined as follows:

- "maximum optimum"-increases are more than 25% from the average taken of multilayered ring growth over many years;
- "optimum"-increases are from 15% to 20% from the average:
- "optimum-pessimum"-extremes occurring during a solar activity phase when they are negative and positive;
- "pessimum"- increases are lower than 15% or 20% from the average;
- "maximum pessimum"-when growth rates are below 25% from the average.

Graphed data clearly illustrates the potential for determining statistically reliable projects of optimums and pessimums accumulating in any of the phases of solar activity.

The categories used as means for tracing species stability constants in both time and space are as follows:

- Dendrochronological Profile of Murmansk - Lithuania - Carpatians, Pinus sylvestris forests growing in dry soil.

- Dendrochronological Profiles from the Northern to the Southern Urals (S.G.Shijatov), Pinus sylvestris, Picea alba, Larix sibirica.

- Dendrochronological Profile of the North American Continent to the West, Pinus ponderosa, Pinus echinata, Pseudotsuga sp., and others.

- Dendrochronological Profile of the North American Continent to the West, Pinus ponderosa.

- Dendrochronological Profile of the East, Picea rubens, Quercus alba, Pinus echinata.

- Dendrochronological Profiles of North to South Lithuania, Pinus sylvestris growing in dry and swampy soils.

- Dendrochronological Profiles of Mongolia, Pinus sylvestris Larix sibirica, Populus laurifolia.

These profiles are distributed over the 70^{o} to 30^{o} latitudes of the Northern Hemisphere. There are difficulties in making direct comparisons, because of the location differences. The American profile is distributed across latitudes of 50^{o} to 30^{o}, whereas the Mongolian dendrochronological scales correspond to latitudes 50^{o} to 43^{o} in its Northern part. The Eurasian scales for Murmansk, the Carpatians and Urals, are at latitudes of 69^{o} to 49^{o}. As such, data is scattered a full 20^{o} latitude to the North.

The explanation for why major forests are concentrated on these continents in such a manner is beyond the scope of this paper. However, it is apparent that cold and hot ocean currents washing continental shores significantly impact formation of atmospheric circulation conditions of the continents. In this manner the activities of warm gulf stream currents have the impact on the far northern coasts of Eurasia, and conversely, the cold Labrador current impedes the spread of forests in the eastern portion of the North American continent.

On the dendroprofile materials provided, it is clear that only the Murmansk - Carpatians profile falls, in part, on continental plains. All the other dendroprofiles are of forests growing entirely in mountainous conditions.

The most abundant and important information is gained from investigating and testing the dendroscales of conifer monocotyledonous tree types. For example, the research materials representing the Murmansk - Carpatian profile have been formulated on the basis of analogical soils of Pinus sylvestris growth. The research has already been used for a doctoral thesis, several candidate dissertation papers, and diploma papers. North American dendroprofiles, composed from several types of conifers, have been used in U.S. research projects. Extreme growth increments which accumulate during the phases of solar activity illustrate that this type of medthodology is also precise.

In separating zones pronounced by optimum or pessimum, the observation is possible of their spead over time from south to north within approximate limits of each eleven year cycle. With this type of peculiarly "curved" system, the situation arises whereby in the places such as northern Murmansk, it is significantly warmer than in Odessa or in Armenia. On the other hand, there are solar activity phases expressing climatic optimum or pessimum which are characteristic over wide territories. Thereby, the existance of the wide network of dendroscales allows for reliable projections of the ecological situation many years in advance.

The methodology is quite reliable, when:

1. values of solar activity (W) are in accordance with forecast. In fact, this does not exist currently. Values of solar activity were significantly higher than the average, in accordance with the author's calculated model.

2. phases of solar activity in time change more rapidly than that by the modelled average. Thus, the necessity of learning to include the appropriate corrections to the models of solar activity is important to accomplish over the nearest future.

In conclusion, over the past five years, the Northern Hemisphere, as well as the entire planet, has been distinguished by high winter temperatures, powerful droughts and periods of high precipitation, and storms, and extreme conditions. The author's inclination is to explain such phenomena by the especially high period of solar activity, thereby, leading to strengthened and more rapid processes of atmospheric circulation and the regions of invariable high pressure.

In Lithuania during the years from 1992 to 1994, abnormal droughts were experienced during the vegetation seasons of spring and summer. The impact was negative on incremental radial growth for all species of trees. As forecast at the Laboratory, the impact was especially adverse to all aspects of forestry life. And unfortunately, the impact on agricultural harvests was distinguishable.

References

1. Bitvinskas, T.T. 1987 Methodical aspects of dendroclimatochronological prognosis. In Climatic Changes in Time and Space and Annual Tree-Rings. Vol.2. Institute of Botany AN Lithuania Kaunas,.pp.4-29 (in Russian).
2. Bitvinskas, T.T. 1984 Bioecological basis of dendroclimachronological investigations. Thesis for degree hab. biological doctor. Institute AN S.S.S.R.of Ecilogy of Plants and Animals.(In Russian).
3. Bitvinskas, T.T. 1992 Sun activity, climate and prognosis of environmental conditions."MAB, Proceedings of the 29-30th meeting of the International Working Group on the project "Species and its productivity in the distribution area" for the UNESCO programme "Man and the Biosphere".Vilnius, pp. 21-25.
4. Bitvinskas, T. Dendroclimatological scales of Soviet Union. Vol.1-4. 1978,1981..1984...(in Russian).
5. Stokes M.A., Drew L.G., Stocton C.W.1973 Tree-ring Chronologies of Western America. 1.Selected Tree-Ring Stations. Laboratory of Tree-Ring, University of Arizona, 87 p.
6. Shijatov S.G. 1981 Dendrochronological scales of North-West European part of USSR. In Dendroclimatochronological scales of the Soviet Union (in Russian), Kaunas, pp.80-86.
7. Shijatov S.G. Dendrochronological scales of Газов Tundra. Dendrochroclimachronological scales of Soviet Union. Vol.3. Kaunas, 1984 pp.54-72. (in Russian).

THE EUROPEAN CORN BORER, OSTRINIA NUBILALIS (HBN.), SETTLEMENT ON MAIZE: EVOLUTIONARY SEQUENCES

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The European corn borer (ECB), Ostrinia nubilalis (Hbn.), is a native European dangerous insect pest of many crops. Its favourite host plant, maize, Zea mays, is of American origin. Settlement of ECB on maize became possible after introduction of the crop to Europe in 1500. First reports on maize injury by the pest were received in France (1879) and Hungary (1886) [Robin, Laboulbe'ne, 1884; Jablonowski, 1897]. Although some data on diversity of the pest populations feeding on maize and wild hosts were obtained [Roubaud, 1928; Stokovskaya, 1966, etc.], a thorough analysis cannot be possible until we get some insight into the regularities of the borer evolution in the native environment [Frolov, 1993].

In the eastern part of the Former Soviet Union (FSU) only ECB is known as a specialized pest of maize; synthetic pheromone trials showed that in Azerbaijan and Middle Asia maize could be damaged by the Persian borer, O. persica Mutuura et Munroe. Dicotyledon feeding populations (on hemp, Cannabis sativa, hop, Humulus lupulus, mugwort, Artemisia vulgaris, cocklebur, Xanthium strumarium, etc.) are greatly variable morphologically [Frolov, 1984]. We studied borer populations having trilobed uncus in males only, which are closely related and are hard to distinguish [Mutuura, Munroe, 1970].

It was found that when feeding on dicotyledonous hosts, European populations of borers with trilobed uncus (ECB, naryn borer, O.narynensis Mutuura et Munroe, brush-leg borer, O. scapulalis (Wlk.), and Persian borer) constituted a common superspecies system [Frolov, 1989 a]. Their differentiation was conditioned by adaptation to varied wetting regimes [Frolov, 1993]. The analysis of genetic structure of borer populations, feeding on dicotyledons, shows that at the European part of FSU the borders of borer spreading are in very good accordance with the average sums