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"MULTI-MILLENNIAL-LENGTH DENDROCLIMATIC RECONSTRUCTIONS AT HIGH-LATITUDE REGIONS OF SIBERIA".

By signing this declaration, I certify that the information given in this proposal relating to me and the team I represent is to the best of my knowledge true and complete. I have been involved in the preparation of the full proposal and I agree with its contents. I am fully authorised to commit myself and the team I represent to be ready to set up and execute all tasks, duties and obligations assigned to us in this research proposal, if selected.

I hereby authorise the co-ordinator as lawful attorney and administrator and empower him to act all of the necessary actions to administrate validly the herein said rights on behalf of me in case the proposal should be selected by INTAS, inter alia, to negotiate and to conclude the co-operation agreement, as well as any amendments, variations or additions to the co-operation agreement on my behalf.

Laboratory of Dendrochronology
Institute of Forest SB RAS
Krasnoyarsk

Dr.Eugene A.Vaganov

5 March, 1997

fAJL projid.txt

1.1 Multi-millennial-length dendroclimatic reconstructions
    at high-latitude regions of Siberia.
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By signing this proposal, I certify that the information given in this proposal is the best of my knowledge, true and complete as received from all project participants; that all participants were involved in the preparation, agree with this project proposal and have declared themselves ready to perform the project as proposed in case of selection.

I am fully authorised to commit myself and the team I represent to be ready to set up and execute all tasks, duties and obligations assigned to us in this research proposal and I am ready to act as the co-ordinator of the project.

The proposal contains ..... pages.

PROJECT CO-ORDINATOR First name and family name:
Fritz Schweingruber

Date: ..... March,1997 Original signature:

fAJL sum.txt

4.1. TITLE OF THE PROJECT
Multi-millennial-length dendroclimaticreconstructions
at high-latitude regions of Siberia

4.2. SUMMARY
This research will make a major contribution to our knowledge of high-resolution climate variability at high latitudes of Western and Middle Siberia throughout the Holocene using the unique potential of tree-ring data.

The specific objectives of this proposal are the development of two supra-long (each spanning 6-9000 years up to present) continuous larch ring-width chronologies at two distant each other high-latitude locations of Siberia (Yamal and Taimyr peninsulas). Ring-width chronologies developed from coniferous trees growing at the polar timberline in Siberia contain a very strong climatic signal, mainly summer air temperatures. With these chronologies high-resolution continuous and quantitative reconstruction of summer temperatures will be made.

As in the areas of the past and present polar and upper timberlines trees megafossils have been preserved properly in large quantities in the Holocene deposits (alluvial, lacustrine and peat), there is a good possibility to develop continuous, multi-millennial tree-ring chronologies.

Now the material already collected and measured (1800 subfossil wood samples from Yamal and 280 samples from Taimyr) has yielded the ring-width chronologies continuously spanning the last 3200 years (Yamal) and 950 years (Taimyr).

However, there are also many more samples that have been measured and have provided data, now assembled in a number of provisionally "floating" chronologies covering much of the period from 7000 to 1700 B.C. (based on some 70 radiocarbon dates of samples of this wood). There is a fair chance that a 6-9000-year continuous chronologies will be constructed within the span of the proposed project.

These chronologies and temperature reconstructions will be the first to be so long, reliable, annually-resolved and precisely-dated with known reliability across the whole of northern Hemisphere. These reconstructions will allow to compare and contrast the details of temperature changes at the moderate-continental region of Yamal Peninsula with the continental region of Taimyr Peninsula and allow modern and predicted temperature patterns to be compared with variability patterns of pre-industrial era. Participants of the proposed project are the well-known institutions which are engaged in the field of dendrochronology and dendroclimatology and have collaborated with each other during the last 6 years.

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3.1 TITLE
Multi-millennial-length dendroclimatic reconstructions
at high-latitude regions of Siberia

3.2 OBJECTIVES
This research will make a major contribution to our knoweledge of high-resolution climate variability at high latitudes of Western and Middle Siberia throughout the Holocene using the unique potential of tree-ring data.

The specific objectives of this proposal are as follows:
- to develop two supra-long (each spanning 6-9000 years up to present) continuous ring-width larch chronologies at two high-latitude locations of Siberia;
- using these tree-ring chronologies, tomake a multi-millennial high-resolution continuous and quantitative reconstruction of summer temperatures;
- to analyse spatio-temporal patterns of temperature variability at these locations over a range of timescales (annual, decadal, multi-decadal and centennial) and their connections with various forcing factors and other annual resolution records being developed elsewhere in the Arctic and Subarctic.

3.3. BACKGROUND

Reconstruction and analysis of natural climatic changes through the whole Holocene at high latitudes are of great importance as climatic conditions, especially air temperature, are most variable and sensitive to various forcing functions (Budyko, 1980; Jones and Kelly, 1983; Intergovernmental Panel on Climate Change, 1990). However, there are a minute quantity of long, precisely-dated and high-resolution proxy climatic series for these regions.

The territory of Yamal Peninsula located on the eastern boundary of influence of the Atlantic air masses and the territory of the eastern part of Taimyr Peninsula located between the Arctic High and Siberian High are of major importance for monitoring regional and global-mean air temperatures and assessing theories and models concerned with past, current and future climate changes (Lamb, 1977; Briffa and Jones, 1993; Moses et al., 1987).

Tree rings as a proxy indicator of the past climatic conditions are of special interest as they allow to reconstruct climatic parameters with seasonal and annual resolution for many hundred and thousand years, to provide an exact absolute and relative dating of the tree-ring data, to establish high-frequency climate changes (from interannual to centennial timescales) with high confidence, to obtain dendroclimatic information practically for every site where trees grow at present or grew in the past.

Intensive dendroclimatic investigations are carrying out in many countries and regions, mainly in temperate and subtropic zones (Fritts, 1976, 1991). At high latitudes such works began later (during the last two decades) and living trees were used primarily for developing tree-ring chronologies of 200-500 years long (Aniol and Eckstein, 1984; Shiyatov, 1984, 1986; Jacoby and D'Arrigo, 1989; Schweingruber, Briffa and Nogler, 1993; Briffa, Jones, Schweingruber, Shiyatov and Vaganov,1996; Jacoby, Wiles, D'Arrigo, 1996; Vaganov, Shiyatov and Mazepa, 1996). As in the areas of the past and present polar and upper timberlines trees megafossils have been preserved properly in large quantities on the surface and in the Holocene deposits (alluvial, lacustrine and peat), there is a possibility to develop continuous, multi-millennium and sensitive to climate tree-ring chronologies. Such works began in the Polar Ural Mountains (Shiyatov, 1986; Graybill and Shiyatov, 1992; Briffa, Jones, Schweingruber, Shiyatov and Cook, 1995), in the southern part of Yamal Peninsula (Shiyatov, Surkov, 1980; Hantemirov, 1995), in Finnish Lapland and Northern Sweden (Zetterberg, Eronen and Briffa, 1995), in the eastern part of Taimyr Peninsula (Vaganov, Naurazbaev, Schweingruber and Briffa, in press) and in the Lower Indigirka River at present. Now the longest, continuous and absolute-dated ring-width chronologies developed for the Yamal Peninsula (spanning 3200 years) and for the Northern Scandinavia (spanning 2160 years) and the "floating" chronologies dated by the radiocarbon method extended back 9500 and over 7000 years respectively.

Ring-width chronologies developed from coniferous trees growing at the polar timberline in moderate-continental and continental regions of Siberia contain a very strong climatic signal, mainly summer air temperatures of tree growth year (Graybill and Shiyatov, 1992; Briffa, Jones, Schweingruber, Shiyatov and Cook, 1995; Hantemirov, 1995; Vaganov, Shiyatov and Mazepa, 1996).The explained variance over the calibration and verification periods is highest reported in the literature to date (65-70%) and it allows to make a quantitative reconstructions of summer temperatures. These chronologies and temperature reconstructions will be the first to be so long, reliable, annually-resolved and precisely-dated with known reliability across the whole of northern Hemisphere. These reconstructions will allow to compare and contrast the details of temperature changes at the

moderate-continental region of Yamal Peninsula with the continental region of Taimyr Peninsula and allow modern and predicted temperature patterns to be compared with variability patterns of pre-industrial era.

Participants of the proposed project are the well-known institutions which are engaged in the field of dendrochronology and dendroclimatology and have collaborated with each other during the last 6 years.

- The Group of Tree-Ring and Site of the Swiss Federal Institute for Forest, Snow and Landscape Research (Birmensdorf, Switzerland). The Group is currently engaged on a major programme of densitometric and ring-width chronology development involving many sites across the whole of the Northern Hemisphere including sites with living trees in the polar timberline area of Russia. This work is specifically designed to provide climatically-sensitive data for use in large spatial climate reconstruction work. Dr. F.H.Schweingruber, Head of the Group, is known throughout the world for his work in wood anatomy and dendrochronology and the development of tree-ring densitometry. He has published extensively in different areas of wood anatomy and tree-growth research and has authored several classic books.

- The Laboratory of Dendrochronology of the Institute of Plant and Animal Ecology of the Russian Academy of Sciences, Ekaterinburg, Russia is one of the leading laboratory in the field of dendrochronology in Russia. The Laboratory has an international reputation for its work on the developing ring-width chronologies at high latitudes and altitudes, reconstruction of climatic conditions, developing long-term chronologies, studying cycles in tree-ring series, using tree-ring data for studies of the upper and polar timberlines dynamics and forest succession. Dr. S.G.Shiyatov, Head of the Laboratory, is one of the pioneers of dendrochronology in Russia and has worked for more than 30 years in the Far North and mountains of the Urals, Siberia, Far East and Middle Asia. He has published more than 130 articles and three monographs. Dr. Shiyatov was the first who began to collect subfossil wood in Russia for developing long-term chronologies.

- The Laboratory of Dendrochronology of the Institute of Forest of the Russian Academy of Sciences, Krasnoyarsk, Russia is another leading laboratory in the field of dendrochronology in Russia. Dr. E.A.Vaganov, Director of the Institute of Forest and Head of the Laboratory of Dendrochronology, has an international reputation for his work on the cell structure of wood lyers of coniferous trees, seasonal growth variations and cambium activity, developing simulation models of seasonal tree growth, developing ring-width and cell chronologies, reconstructing climatic conditions of the past using tree-ring chronologies. He has published more than 100 articles and 5 monographs.

- The Climatic Research Unit of the University of East Anglia, Norwich, Great Britain is one of the world's leading research organisation specialising in the study of climate change: climate history, current climates, projected changes and impacts. Dr. K.R.Briffa, Senior Research Associate at the Climatic Research Unit, has considerable experience in climatology and with the use of statistical methods of climate analyses and dendroclimatic reconstruction, especially with regard to large-spatial-scale reconstructions of climate patterns and published many articles on the theoretical and practical aspects of dendrochronology and dendroclimatology, and on use of paleoclimate data for understanding current and possible future climates.

3.4 SCIENTIFIC AND TECHNICAL DESCRIPTION

3.4.1. RESEARCH ACTIVITIES

Tree-ring data will be obtained from living trees and subfossil wood of Siberian larch (Larix sibirica Ledeb.) in western Siberia and Gmelini larch (Larix Gmelini Pilger) in central Siberia. The first location is situated in the southern part of Yamal Peninsula (67-688N, 69-718E), the second location in the eastern part of Taimyr Peninsula (71-738N, 98-1058E). There is a great many properly preserved subfossil wood in the Holocene deposits at both locations, mainly in the alluvial and peat deposits.

The main variable measured will be ring width. This variable reflects properly climate influences on tree growth at the polar timberline areas of Siberia having a continental climate.

Ring-width chronologies for the last 400-500 years will be developed from the oldest living trees. Extensions to these chronologies back further in time will be made by using subfossil material, joined with the living material by standard crossdating procedures. High-precision radiocarbon dates will be used for rough dating of "floating" tree-ring chronologies.

The sampling subfossil wood and development of the Yamal's supra-long chronology began since 1982 by the workers of the Laboratory of Dendrochronology (Ekaterinburg). Most intensively this work was carried out during the last five years. Now the material already collected and measured (1800 subfossil wood cuts) has yielded the ring-width chronology continuously spanning the last 3200 years. However, there are also many more samples that have been measured and have provided data, now assembled in a number of provisionally "floating" chronologies covering much of the period from 7000 to 1700 B.C. (based on some 45 radiocarbon dates of samples of this wood). These chronologies separated by 50 to 500 year length gaps. There is a fair chance that a 9000-year continuous chronology will be constructed for this location within the span of the proposed project.

Similarly, work with a shorter history than the Yamal's research has clearly established potential to build a chronology at least as long in the Taimyr Peninsula where the modern polar timberline extends to about 72830'N, most northern over the world. This work is not so advanced as in Yamal, but the work to date suggests that very rapid progress is likely. Samples from living and dead trees have already been assembled at the Laboratory of Dendrochronology (Krasnoyarsk) into the 950-year continuous chronology. The collections from this location are not so extensive as those made to date at Yamal (280 subfossil wood samples), but there is an abundant supply of subfossil trees, many with over 300 annual rings. 25 radiocarbon dates of samples of this material suggest major phases of tree growth around 8500 B.P. and 5000 B.P. The general distribution of the radiocarbon dates suggests that, eventually, sufficient trees can probably be located to span the whole of the last 10000 years. It is not expected that a continuous 10000-year ring-width chronology will be produced within timeframe of this project. However, there are good prospects of producing a 5-6000- year chronology to the present.

3.4.2 RESEARCH RESULTS
During three years we expect to develop the continuous and good-replicated tree-ring 9000-year larch chronology for the Yamal Peninsula and the 5-6000-year larch chronology for the Taimyr Peninsula. Using these chronologies we intend to reconstruct and analyse a summer temperature variation at several time scales (annual, decadal, multi-decadal and centennial) and compare the data obtained with other high-resolution Holocene-length proxy data (ice cores, laminated sediments, historical documents).

The results of this project will be published primarily in the scientific literature in Russian and English and presented at

different national and international conferences. Because of the fundamental interdisciplinarity and collaborative interaction within the subgroups, a number of multi-authored papers will be produced. The individual and mean ring-width chronologies and the reconstructions produced will be distributed to the international scientific community through submission to the International Tree-Ring Data Bank (Boulder, Colorado, USA) and to other national and international institutions and data centres.

3.5 MANAGEMENT INFORMATION

3.5.1 TASK DIVISION
Dr F.H.Schweingruber (Swiss Federal Institute for Forest, Snow and Landscape Research) will be the project co-ordinator on the proposed project from the INTAS countries.

Dr S.G.Shiyatov (Institute of Plant and Animal Ecology) will be the responsible scientist on the proposed project and he will take part in collecting, dating, developing and analysing the multi-millennial ring-width chronology at the area of Yamal Peninsula. The next young scientists of the Institute will be involved in the project:
Rashit M. Hantemirov, Candidate of Biological Sciences, 34 years old. He will take part in collecting, cross-dating and analysing the material.
Alexander Yu. Surkov, technician, 30 years old. He will take part in collecting, preparing and measuring the subfossil wood samples.

Dr E.A.Vaganov (Institute of Forest) will be the responsible scientist on the proposed project and he will take part in collecting, dating, developing and analysing the multi-millennial ring-width chronology at the area of Taimyr Peninsula. The next young scientists will be involved in the project:
Mukhtar M. Naurazbaev, junior research fellow,35 years old. He will take part in collecting, preparing, measuring, cross-dating and analysing the material.
Alexander V.Kirdyanov, post-graduate, 25 years old. He will take part in data processing, density measurements, chronology analysis.
Dmitry V.Ovchinnikov, post-graduate, 26 years old. He will take part in cross-dating, data processing, chronology analysis.

Dr K.R.Briffa (Climatic Research Unit) will be the responsible scientist on the proposed project and he will take part in analysing growth-climate relationships, developing statistical models of tree growth, extracting climatic signal, reconstructing and analysing climatic conditions of the remote past.

3.5.2 PLANNING
To carry-out the objectives of this proposal the workers of the Russian laboratories will carry out an intensive collecting subfossil wood during summers of 1997-1998 at two high-latitude locations (Yamal and Taimyr peninsulas) using helicopters, boats and ships. To finish the development of the Yamal chronology it is necessary to collect additionally no less than 300-400 cuts of subfossil wood. Much more intensive collecting (600-800 cuts for two field seasons) is needed to develop the Taimyr chronology. All samples collected during these two years and earlier will be measured and cross-dated at Ekaterinburg and Krasnoyarsk laboratories until the middle of 1999.

The Russian laboratories together with the Climatic Research Unit of the University of East Anglia during 1997-1999 will be analysing the material obtained (standardization of individual series, development of mean chronologies, studying growth-climate relationships, developing statistical models of tree growth, extracting climatic signal, reconstructing and analysing climatic conditions of the remote past). This work will be finished at the

end of 1999.

3.5.3 EQUIPMENT
Participants of the proposed project have the necessary equipment for fieldwork, measuring equipment and compatible software.

3.5.4 SCIENTIFIC REFERENCES
Briffa, K.R., Jones, P.D., Schweingruber, F.H., Shiyatov, S.G. and Cook, E.R. Unusual twentieth-century summer warmth in a 1,000-year temperature record from Siberia. Nature, 1995, Vol. 376, 13 July, 156-159.

Briffa, K.R., Jones, P.D., Schweingruber, F.H., Shiyatov, S.G., Vaganov, E.A. Development of a North Eurasian chronology network: Rationale and preliminary results of comparative ring-width and densitimetric analyses in Northern Russia. Radiocarbon, 1996, 25-41.

Hantemirov, R.M. A 2,305 year tree-ring reconstruction of mean June-July temperature deviations in the Yamal Peninsula. Publication of the Academy of Finland,1995, 6, 124-127.

Shiyatov, S.G., Mazepa, V.S., Vaganov, E.A., Schweingruber, F.H. Summer temperature variations reconstructed by tree-ring Data at the polar timberline in Siberia. Radiocarbon, 1996, 61-70.

Vaganov, E.A., Shiyatov, S.G., Mazepa, V.S. Dendroclimatic Study in Ural-Siberian Subarctic. Novosibirsk: "Nauka", Siberian Publishing Firm RAS, 1996, 246 pp. (in Russian).