7th International conference on Dendrochronology, June 11-17, 2006, Beijing, China
Cultural Diversity Environmental Variability
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Climate from the 7520-year unbroken Scots pine tree-ring chronology for Finnish Lapland

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Tree rings are of great importance as high-resolution proxies of past climate. A long well established dendrochronological record from a climatologically sensitive area can provide valuable indications of the Holocene climatic variability. Here we report a 7638 year long continuous Scots pine tree-ring record from the treeline area of Northern Fennoscandia.

Scots pine (*Pinus sylvestris*, L.) immigrated to northern Finnish Lapland by 9.5 - 9 ka calBP and spread in favourable climatic conditions to a larger area than that occupied by pine forests today. The time of the maximum extent was between 7 and 4.5 ka calBP. A large number of subfossil pine trunks and stumps have been preserved in small lakes in Lapland in the present treeline area and also beyond it. An earlier work in Lapland resulted in several dozens of radiocarbon dates for subfossil pine wood. The dated sample discs could be used to tie the initial floating chronologies to the radiocarbon timescale. The master curve was completed in 1999 by professor **Matti Eronen**'s research group in the ADVANCE-10K project (http://www.cru.uea.ac.uk/advance10k/).

The present pine tree-ring chronology extends from the present time to 5633 B.C. Tree-ring samples of Scots pine (*Pinus sylvestris* L.) were collected from living trees, dead standing logs, old buildings, and subfossil wood from small lakes, selected dataset containing at present 1081 tree-ring series in all. The latter archive is the major source of samples. The area is situated between 68° and 70° N, 20° and 30° E, located in the northern part of the boreal forest belt in Fennoscandia, between the Swedish Scandes and the Kola Peninsula.

The long pine tree-ring curve indicates interannual variations of June-July temperatures in northern Fennoscandia. The annual resolution has made it possible to reconstruct a high-frequency record of temperature variability over thousands of years. It gives also a potential to study many of past climatic and environmental variables. The high-resolution proxy record covering a major part of the Holocene can be used now for many kind of analyses, measurements and correlations with other proxies. However, it is rather difficult to extract information about low-frequency climatic variations from this data.

The Finnish supra-long pine chronology is so far not long enough to overlap the specific cooling period observed in northern hemisphere about 8200 years ago. It seems there was a drastic drop of 1-5 ^{o}C in annual mean temperatures lasting for a few hundred years. The event is connected to a slowdown of the Gulf stream, which was probably caused by the cold pent up waters in Hudson Bay releasing into the North Atlantic. It is possible that similar "flip−flop" event might take place as resulted by global warming.

Our target is now try to find over 8000 year pine megafossils and analyse from tree-rings, how Finnish climate changed in those days. In theory we can conclude the following: if the westerlies prevailed during the cool Gulf stream, the summers were cooler than normal, thus resulting reduced growth in trees. In the case of the easterlies prevailing, continental weather caused warm, even hot summers. This should be seen as increased growth in trees.