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Solar and volcanic signals in tree-rings from Kola Peninsula and Northern Lapland

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1. A role of solar activity and powerful volcanic eruptions as a trigger of changes in climate and environment is still a subject of scientific discussion. Here we present an analysis of some tree ring chronologies collected from living trees at Northern timberlines of Kola Peninsula. They are: a 676-year juniper (Juniperus Sibirica Burgst.) from Keivy hill region in the center of Kola Peninsula (67.77 N, 33.25E), a 561-year tree-ring chronology of pine (Pinus sylvestris) and a 452-year pine (Pinus sylvestris) chronology sampled at altitude tree line at Khibiny mountains.
2. The MTM spectral and wavelet analysis of juniper chronologies showed:
a) 20-22-year and 80-100-year periodicities coinciding to corresponding cycles of solar activity;
b) absence of main 11-year cycle of solar activity;
c) 20-22-year periodicity was not significant throughout the entire 700-year period, but during certain time intervals: 1328 – 1550, 1710-1800, from 1985 to present;
d) wavelet analysis of both solar activity and juniper tree-ring records showed that 50 and 60-70-year periodicities occurred from 1700 till 1850.
All chronologies demonstrated that the minima of solar activity: Sporer (1416-1534 AD), Maunder (1645-1715 AD) and Dalton (1801-1816 AD) were accompanied by temperature decreases. Some recent decreases in solar activity, even in XX century (around 1900 and 1960), seem to be linked to the period of reduced tree growth. It is very difficult to note effects of "global warming" at the end of XX century on our data.
3. A superposed epoch analysis of 19 large (VEI>4) volcanic events revealed a significant suppression of tree growth for up to 8 years following volcanic eruptions. The similar effect was obtained under analysis of the part of 7641-year supralong pine tree-ring chronology from Finnish Lapland.
4. A combined influence of solar activity and powerful volcanic eruptions was investigated around Dalton minimum of solar activity (1801-1816 AD) when two powerful volcanic eruptions (Laki 1783 AD and Tambora 1815 AD) were detected.
The results presented give us evidences of strong natural external factor influence on climatic system and permit us give some prognosis of future climatic changes at the North of Europe.
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