EGU24-12747, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-12747
EGU General Assembly 2024

Fennoscandian AND Yamalian tree-ring anatomy shows a warmer modern than medieval climate

Jesper Björklund[1,2,3], Kristina Seftigen[1,2], Markus Stoffel[4,5,6], Marina V Fonti[1], David C Frank[7], Sven Kottlow[1], Jan Esper[8,9], Patrick Fonti[1,3], Hugues Goosse[10], Håkan Grudd[11], Björn E Gunnarson[12,13], Rashit Hantemirov[14], Stefan Klesse[1,3], Vladimir Kukarskih[14], Daniel Nievergelt[1,3], Elena Pellizzari[15], Marco Carrer[15], and Georg von Arx[1,3]

[1]Swiss Federal Institute for Forest Snow and Landscape Research WSL, Birmensdorf, Switzerland (jesper.bjoerklund@wsl.ch)
[2]Regional Climate Group, Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden
[3]Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland
[4]Climate Change Impacts and Risks in the Anthropocene (C-CIA), University of Geneva, Geneva, Switzerland
[5]Dendrolab.ch, Department of Earth Sciences, University of Geneva, Geneva, Switzerland
[6]Department F.-A. Forel for Environmental and Aquatic Sciences, University of Geneva, Geneva, Switzerland
[7]Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ, USA
[8]Department of Geography, Johannes Gutenberg University, Mainz, Germany
[9]Global Change Research Institute of the Czech Academy of Sciences (CzechGlobe), Brno, Czech Republic
[10]Earth and Life Institute, Université Catholique de Louvain (UCLouvain), Louvain-la-Neuve, Belgium
[11]Swedish Polar Research Secretariat, Abisko Scientific Research Station, Abisko, Sweden
[12]Department of Physical Geography, Stockholm University, Stockholm, Sweden
[13]Bolin Centre for Climate Research, Stockholm University, Stockholm, Sweden
[14]Institute of Plant and Animal Ecology, Ural Division of the Russian Academy of Sciences, Ekaterinburg 620144, Russia. 2Ural Federal University, Ekaterinburg 620002, Russia
[15]Department of Land, Environment, Agriculture and Forestry (TeSAF), University of Padua, Padua, Italy

Earth system models and various climate proxy sources indicate that global warming is unprecedented during at least the Common Era. However, tree-ring proxies often estimate temperatures during the Medieval Climate Anomaly (950–1250 CE) to be similar, or exceed, those recorded for the past century. This is in contrast to simulation experiments at regional scales. This not only calls into question the reliability of models as well as proxies, but also contributes to uncertainty in future climate projections. Here we show that the current climate of Fennoscandia is substantially warmer than during the medieval period. This indicates a dominant role of anthropogenic forcing in climate warming even at the regional scale, thereby reconciling differences between reconstructions and model simulations. These results were obtained using an annually resolved 1,170-year-long tree-ring record that relies exclusively on tracheid anatomical measurements from *Pinus sylvestris* trees. Now we can confirm these results using new tree-ring anatomy data developed from *Larix Sibirica* tree-ring samples from the Yamal Peninsula in North-western Siberia over the past millennia. Both these datasets provide exceptional high-fidelity measurements of instrumental temperature variability during the warm season. We call for the

construction of more such millennia-long records to continue to improve our understanding and reduce uncertainties around historical and future climate change at increasingly larger scales.