

Uncertainty of tree-ring based temperature reconstruction: Effects of soil moisture environment and air pollution on reconstruction records

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Since global observation records only cover for the last 120 years, the paleoclimate reconstruction using proxy records is indispensable to fully understand past climate change on a multi-decadal/century time scale. Tree rings have long been used to be an excellent proxy for temperature. However, since the latter half of the 20th century, the correlation between the tree ring parameters (width and density) and temperature has been significantly weakened in several areas in the northern high latitudes, which likely reduces credibility of the reported tree-ring based temperature reconstructions. While the temperature records indicate a substantial warming trend in the late 20th century, tree rings in such areas do not display a corresponding change. Although some hypotheses on explaining the inconsistency have been suggested, the best mechanism for fully understand it has not been obtained yet.

The purpose of our study is to identify the environmental factors responsible for the influencing the relationship between tree-ring parameters and temperature in the northern high latitudes by using available datasets for tree ring parameters and environmental variables. We focus on two environmental factors: 1) soil moisture environment; 2) air pollution, both of which might affect plant carbon uptake processes through adjustment of stomatal openness. We clarify the effects of these environmental factors on tree ring parameters. In this presentation, we intend to show the preliminary results on this, especially for the possible impact of the air pollution on the tree ring parameters.

Keywords: Temperature reconstruction, Tree ring, Air pollution