Disentangling the effects of micro-site ecology on Fennoscandian tree growth

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The long tradition in dendroclimatological studies across Fennoscandia is mainly due to the exceptional strong temperature sensitivity of tree growth, as well as the existence of well-preserved subfossil wood in shallow lakes and extent peat bogs. Although some of the world's advanced multi-millennial-long ring width and density based climate reconstructions have been developed in northern Fennoscandia, it is still unclear if differences in micro-site ecology have been considered sufficiently in previous studies. In order to assess the effects of moist lakeshores versus drier inlands on forest productivity, we present a Fennoscandia-wide network of 44 Scots pine ring width chronologies from 22 locations between 59\(^\circ\)-70\(^\circ\)N and 16\(^\circ\)-31\(^\circ\)E. Clustering into coastal settings in northern Norway, continental sites in the lee of the Scands north of the polar circle, and locations south of the polar circle, our network reveals a general dependency of pine growth rates on latitude and July temperature. Differences between moist and dry sites are likely caused by associated effects on soil temperature. While trees at moist micro-sites at western locations exhibit higher growth rates, this pattern inverses under the more continental conditions of the east, where increased ring widths are found at drier sites. In addition to the latitudinal increase in growth sensitivity to July temperature, pines at moist sites tend to show a higher dependency to summer warmth. The highest temperature sensitivity and growth coherency is found in those regions where July temperatures range between 11.5 and 13.5\(^{\circ}\)C and May precipitation totals fall below 100mm. This study not only emphasizes the effects of micro-site ecology on Fennoscandian tree growth, but also provides guidance for the selection of sampling sites for climate reconstructions.

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