Title:

Analogous Tree Growth Pattern in Contrary Climate Regions Along the Arctic Margin

Authors & affiliations:

Ingrid E. Mathisen and Annika Hofgaard
Norwegian Institute for Nature Research, Trondheim, Norway

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The northern distribution limit of Scots pine, *Pinus sylvestris*, is predominantly controlled by climate and as temperature increase, a northward shift and more vigorous growth is expected. Implications of changed forest cover include changed carbon sequestration, changed land-atmosphere energy balance and ecosystem changes. Understanding of climate related height- and diameter-growth patterns across geographical regions is therefore essential. The main focus in this study is climate-growth relationship for pine during last decades, along longitudinal and coast-inland gradients in Northern Norway and Kola Peninsula; by analysing i) how height and diameter growth at the northern distribution margin have responded to climate variability; ii) if growth responses differ between climatic regions; and iii) if short-term height and diameter growth-climate relations are useful predictors for forest cover change. Six pine woodland sites along the forest-tundra zone were analysed for annual height growth (saplings, i.e. <2m) and diameter growth (adult trees) and compared with local climate data. Pearson's correlation analyses and bootstrapped confidence intervals were used in the analyses. Height growth correlated strongly among all sites while diameter growth showed limited correlation among sites. However, an inter-annual pattern with common growth peaks among sites is evident for both height and diameter growth. Although summer temperature is the most important factor(s) to both height growth ($July_{t-1}$) and diameter growth ($July_{t-1}$, $June_t$, $July_t$), winter (November-February) and late non-growing season (April-May) temperature and precipitation showed significant importance to both height and diameter growth. The results highlight the importance of generally overseen precipitation and non-growing season factors to growth at northern distribution limits. Detailed data on climate-growth relations is essential to feed models for forest cover change. However, short-term generated data may be of sub-ordinate long-term value due to high inter-annual climate variability at the Arctic margin and occurrence of infrequent severe climate events.

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