THE CONCEPT OF INTER-SEASONAL TREE-RING GROWTH MONITORING BASED ON XYLOGENESIS OBSERVATIONS AND PROCESS-BASED VAGANOV-SHASHKIN MODEL

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During last decades, current and expected climatic changes have stimulated many researchers to study the effect of warming on boreal forest ecosystem and related global carbon and water cycles. It is well known, that wood is an important medium for tree transpiration and represents the main terrestrial biotic reservoir of carbon. It is thus of relevance to understand how wood formed and how the environment shape its structure. Eddy-covariance and remote sensing methods are not appropriate to describe the seasonal accumulation of wood due to a lack of precision and resolution.

The Vaganov-Shashkin model (VS-model) is one possible way to link high-resolution tree radial growth with the environmental factors. This model, which is able to describe tree-ring growth as the result of multivariate nonlinear biophysical processes included effects of temperature, precipitation, and seasonal day length changes, has demonstrated a good ability to simulate tree-ring growth of spatially distributed coniferous species and to obtain unique patterns of climate-growth relationship at both intra- and inter-annual scales. However, more observational data are required to further improve the skill of the model and thus have better tools to interpret tree growth and climatic signals in tree-ring proxies.

In this work, we present an example on how to collect new filed data to improve the model. Specifically, our study assess the timing and dynamics of wood formation of coniferous species under different habitats conditions by carrying out weekly field sampling of xylem micro-cores. This is a fundamental step to define the main environmental factors influencing the processes of growth described by the model. Understanding how tree-ring growth depends on site/habitat conditions is essential to predict tendencies in stem wood productivity under projected climate changes.

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