Geophysical Research Abstracts
Vol. 17, EGU2015-3228, 2015
EGU General Assembly 2015

Does carbon availability control temporal dynamics of radial growth in Norway spruce (Picea abies)?

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Intra-annual dynamics of cambial activity and wood formation of coniferous species exposed to soil dryness revealed early culmination of maximum growth in late spring prior to occurrence of more favourable environmental conditions, i.e. repeated high rainfall events during summer (Oberhuber et al. 2014). Because it is well known that plants can adjust carbon allocation patterns to optimize resource uptake under prevailing environmental constraints, we hypothesize that early decrease in radial stem growth is an adaptation to cope with drought stress, which might require an early switch of carbon allocation to belowground organs. Physical blockage of carbon transport in the phloem through girdling causes accumulation and depletion of carbohydrates above and below the girdle, respectively, making this method quite appropriate to investigate carbon relationships in trees. Hence, in a common garden experiment we will manipulate the carbon status of Norway spruce (Picea abies) saplings by phloem blockage at different phenological stages during the growing season. We will present the methodological approach and first results of the study aiming to test the hypothesis that carbon status of the tree affects temporal dynamics of cambial activity and wood formation in conifers under drought.

Acknowledgment
The research is funded by the Austrian Science Fund (FWF): P25643-B16 “Carbon allocation and growth of Scots pine”.

Reference
Oberhuber W, A Gruber, W Kofler, I Swidrak (2014) Radial stem growth in response to microclimate and soil moisture in a drought-prone mixed coniferous forest at an inner Alpine site. Eur J For Res 133:467-479.