



## **Climate influences relationships between tree rings and NDVI throughout Carpathian primary forests**

Jonathan Schurman (1), Cornelius Senf (2), and Miroslav Svoboda (1)

(1) Czech University of Life Sciences, Forestry, (jonathan.schurman@utoronto.ca), (2) Humbolt University, Berlin

**Aim:** Normalized difference vegetation indexes (NDVI) and tree rings are two valuable sources of information for understanding spatiotemporal variation in canopy physiology and wood production, respectively. Integrating these data streams holds great promise for improved quantification of forest productivity at large scales. However, strong biases in the distribution of available tree ring data (predominately old trees on climatically extreme sites) remains an important constraint on assessments of NDVI and tree ring width (TRW) relationships.

**Location:** The Carpathian Mountains

**Methods:** In total, 8 387 tree cores were collected from a network of 529 forest inventory plots (0.1 ha) in fragments of primary Picea forests, designed to ensure an unbiased representation latitudinal and altitudinal variation throughout the Carpathian Mountains ([www.RemoteForests.org](http://www.RemoteForests.org)). Annual growing season (June through September) maximum NDVI composites were derived from all available Landsat observations per plot. Climatic constraints on interannual variation in TRW and NDVI were determined by comparison to regional weather-station data (<http://www.carpatclim-eu.org>). Correlations between TRW and NDVI (c. 1984-2010) were also calculated.

**Results:** Climatic constraints on TRWs and NDVI, and interrelationships between TRW and NDVI, are highly spatially variable. Positive correlations between TRWs and NDVI were highest in the Northwestern Carpathians. Sensitivity of TRW and NDVI to July temperatures was the strongest indicator of agreement between TRWs and NDVI, suggesting co-limitation of canopy physiology and wood production by low temperatures. Extreme droughts may also play a role in disrupting TRW and NDVI relationships.

**Main conclusions:** Agreement between TRW and NDVI appears highest when temperatures are low, suggesting that latitudinal variation in autotrophic respiration may be an important determinant TRW-NDVI relationships. Further discrepancies may result from the legacies of climatic extremes. Substantial work remains before NDVI should be taken as a measure of net primary productivity.