



Young and full-grown spruce tree soil-plant-atmosphere systems studied by sap flow measurement methods

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Spruce trees are major woody plants of mountain forests in the Central Europe. Transpiration of spruce is therefore one of the main driving forces of soil water dynamics in the root zone and an important part of the ecosystem water balance.

In the study, the results of long-term monitoring of spruce water uptake dynamics in two headwater catchments are presented. Experimental catchment Liz is located in a forested mountain area of Sumava Mts. in the southern part of the Czech Republic. Uhlirská catchment, situated in headwater region in the north-west of the Czech Republic (Jizera Mts.), is currently undergoing reforestation process. Both sites are instrumented for monitoring of the relevant meteorological and hydrological variables. Soil water dynamics in the soil profile is monitored by automated tensiometers and soil moisture sensors based on frequency domain reflectometry. Long-term sap flow observations conducted on six full-grown tree specimens (heat field deformation method, Liz) and three young tree specimens (heat dissipation method, Uhlirská) provide valuable information about transpiration demand of mountain spruce forest of all ages.

Sap flow dynamics and spatial and temporal variability is analyzed and compared to observed meteorological data. Soil water responses to atmospheric forcing (rain and transpiration) are analyzed by means of numerical modeling based on Richards' equation. Simulated responses are compared with tensiometric and soil water content data. The research is supported by the Czech Science Foundation project No. 205/08/1174.