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## Ecohydrological Behaviour of Mountain Beech Forest: Quantification of Stomatal Conductance Using Sap Flow Measurements

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In forested regions, transpiration as the main component of evaporation fluxes is important for evaporation partitioning. Physiological behaviors among various vegetation species are quite different. Thus, an accurate estimation of the transpiration rate from a certain tree species needs specific parameterization of stomatal response to multiple environmental conditions. In this study, we chose a 300-m<sup>2</sup> beech forest plot located in Vydra basin, the Czech Republic, to investigate the transpiration of beech (*Fagus sylvatica*) from the middle of the vegetative period to the beginning of the deciduous period, covering 100 days. The study area experienced bark beetle infestation, and the trees are newly formed, and mixed forest stands (spruce and beech) have transformed into beech stands. From the differences in the rooting depth of each kind of tree, an impact on the long-term water regime is expected. Furthermore, trees can change soil moisture distribution or water storage in aquifers by transpiration. Therefore, the sap flow equipment was installed in six trees with varying ages among 32 beech trees in the plot, and the measurements were used to infer the stomatal conductance for the beech forest. The diurnal pattern of stomatal conductance and the response of stomatal conductance under the multiple environmental conditions were analyzed. The results showed that the stomatal conductance inferred from sap flow reached the highest at midday but, on some days, there was a significant drop at midday, which might be attributed to the limits of the hydraulic potential of leaves (trees). The response of stomatal conductance showed no pattern with solar radiation and soil moisture, but it did show a clear correlation with the vapor deficit, in particular when explaining the midday drop. The relation to temperature was rather scattered as the measured period was in the moderate climate. The findings highlighted that the parametrization of stress functions based on the typical deciduous forest does not perfectly represent the measured stomatal response of beech. Therefore, measurements of sap flow can assist in better understanding transpiration in newly formed beech stands after bark beetle outbreaks in Central Europe.

**Keywords:** Transpiration; beech forest; stomatal conductance; sap flow measurement

