

TRANSPIRATION OF A MIXED FOREST STAND: FIELD MEASUREMENTS AND MODEL ESTIMATIONS

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Transpiration of a mixed spruce-aspen-birch forest stand at the southern part of the Valday Hills in Russia was determined using sap flow measurements and SVAT models. The measurements showed a significant variability of transpiration rates between different species and different trees. Under non-limited soil water conditions broadleaf trees transpired about 10-20% more than spruces trees. Deficit of available water in the upper soil layers had a more pronounced influence on water uptake of spruce than of deciduous tree species due to the shallow spruce root system. Under surplus water in the upper soil layers the transpiration rates were slightly suppressed both for spruce and for broadleaf tree species. Two one-dimensional multi-layer SVAT models were applied to describe energy and water exchanges between mixed forest stand and the atmosphere. A more simplified MLOD-SVAT model uses averaged biophysical properties of different tree species. Estimation of forest water uptake in a more sophisticated EWE-MF model is based on separate description of water uptakes for individual tree species. Comparisons of modelling and measuring results show that under non-limited soil water conditions both modelling approaches allow to describe in a representative way the water uptake and transpiration rates. Under limited soil water conditions more sophisticated model could deduce more representatively the effect of different tree species on forest transpiration. Application of more simplified MLOD-SVAT model can result in an overestimation of daily total forest transpiration up to 50%.