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# Canopy conductance of a high density poplar stand in Czech-Moravian Highlands

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One of the most widely used approaches for modelling evapotranspiration is based on the Penman-Monteith concept. Within the frame of this analytical approach, canopy conductance remains the only variable which has to be predicted. In order to upscale the results of water use from bioenergy poplar plantations at the locality Domanínek in Czech-Moravian Highlands (49° 31′ N, 16° 14′ E and altitude 530 m a.s.l.) to different environmental conditions, we investigated the canopy conductance based on Bowen ratio energy balance measurements and its dependency on the basic meteorological and ecophysiological variables during 2008-2012. The plantation within the scope of this study is a monoclonal (Populus nigra x P. maximowiczii) high density stand with an area close to 3 ha. It was established in 2002 and the first harvest was carried out during the winter 2009/2010.
The canopy conductance was strongly related to the leaf area index and thus showed typical seasonal patterns with the highest values in summer. The daily medians varied mostly within the range of 10 to 20 mm/s. In August 2012 when a pronounced drought stress has occurred, the daily medians of the canopy conductance decreased below 5 mm/s. Thus, apart from the leaf area index, the soil water availability was the most important predictor of the canopy conductance from the long term point of view (weeks or months). During the course of day, the canopy conductance can be well explained by nonlinear decreasing with increasing vapour pressure deficit and by increasing with the global radiation according to so called Lohammar model. In average, during the nearly light saturated periods (global radiation higher than 500 W/m2) the canopy conductance decreased from 23 mm/s through 12 mm/s to 6 mm/s for vapour pressure deficits 0.5, 1, and 2 kPa, respectively. By comparing the canopy conductance to the aerodynamic conductance, so called de-coupling factor (0-1) can be calculated. This factor ranged typically between 0.2 to 0.6 with the higher values during the midseason. This suggests that this high density poplar culture becomes more decoupled from the atmosphere with increasing leaf area index and decoupling factor is within 0.4 to 0.6 when the leaf area index exceeded 3. Such type of an intermediate coupling to the atmosphere brings an important question whether it is more advantageous to model evapotranspiration of such poplar cultures using the crop coefficient approach or concept based on the canopy conductance to vapour pressure deficit relation. Whilst the first method is generally more suitable for agricultural crops, the second one is more successfully applicable for forests. Results and comparison of both ways will be presented in more details at the conference.

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