Aerodynamic parameter changes above a young spruce forest stand during five growing seasons

T. Hurtalová, F. Matejka
Geophysical Institute of the Slovak Academy of Sciences[1]

J. Rožnovský, I. Marková
Department of Landscape Ecology, Mendel University of Agriculture and Forestry[2]

D. Janouš
Institute of Landscape Ecology, Academy of Sciences of the Czech Republic[3]

A b s t r a c t : The results of vertical profile measurements of the wind speed have been evaluated with the aim to analyze and quantify the influence of a young spruce forest stand on the wind flow and aerodynamic characteristics. The experimental data were obtained at the Bílý Kříž Experimental Ecological Study Site in Moravian-Silesian Beskydy Mts (49°30′17″ N, 18°32′28″E, 908 m a.s.l.). The experimental site consisting of two plots Fd and Fs is created by the monoculture of young Norway spruce stand (*Picea abies L.,* Karst) with density of 2600 trees per ha in Fd plot and 2400 trees per ha in Fs plot. After the thinning in May 2001, the density in Fs plot was reduced to 1880 trees per ha. The experimental data were measured in and above this spruce forest stand during growing seasons (May – October) of 1998-2002. The mean seasonal values of the zero plane displacement d in Fd plot increased during the investigated period from 5.3 m to 7.1 m and the mean seasonal values of the dynamic roughness length z_0 ranged between 0.48 m to 0.61 m. The corresponding values in Fs plot varied within this period in the intervals 4.2 m – 6.2 m and 0.41 m – 0.69 m, respectively. It was shown, that the local terrain influenced the power of the airflow and vertical wind speed profiles in Fd and Fs plots. The dependence between the friction velocity u^* and the wind speed $u(h)$, measured at the mean height of the forest (h), indicated that the investigated young spruce forest

[1] Dúbravská cesta 9, 845 28 Bratislava 45, Slovak Republic
e-mail: geoftahu@savba.sk, geofmate@savba.sk
[2] Zemědělská 1, 613 00 Brno, Czech Republic;
e-mail: roznovsky@chmi.cz; markova@mendelu.cz
[3] Na sádkách 7, 370 05 České Budějovice, Czech Republic; e-mail: ejanous@brno.cas.cz

stand was in an aerodynamic unsteady state. Consequently, the values of the z_0 were dependent on the wind speed.

Key words: aerodynamic characteristics, spruce forest stand, zero plane displacement, roughness length