



Aerodynamic characteristics of spruce stand influenced by snow damage

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Forest damage caused by wind, snow, and frost is a serious economical problem concerning forestry in Europe. On the other site the damaged forest influences the airflow and meteorological characteristics in the atmosphere layer affected by this stand.

Influence of snow damage on the aerodynamic characteristics of the forest stand was investigated during the growing seasons of the 2005 and 2006 before and after the winter 2005/2006 which caused the forest damage. The investigated forest is situated in the locality Bílý Kříž in Moravian-Silesian Beskydy, Czech Republic. The experimental site consisting of two plots with different stand density is created by the monoculture of a Norway spruce stand.

With the aim to determine the influence of snow damage on the aerodynamic characteristics: the dynamic roughness length (z_0) and the zero plane displacement height (d), the wind speed profiles measured in and above investigated spruce stand were analyzed. The microclimatic profile measurements of the wind speed in and above this forest were carried out in 6 levels on 26 m high tower.

The winter 2005/2006 in the investigated locality was characterized by continuous snow blanket from November 2005 to April 2006 with high water value. Forest damage by this snow was noticeable, mainly in denser plot. About 30% from investigated trees were broken in dense (Fd) plot and 13% in sparse (Fs) plot. The tree heights were measured on 514 individuals in Fd plot and on 414 ones in Fs. It evokes occurring of new conditions for airflow within and above the forest stand and then changes of aerodynamic characteristics. The zero plane displacement value decreased and the

dynamic roughness length increased. In Fd plot investigated parameters were: $h = 11.9$ m, $d = 8.5$ m, and $z_0 = 0.9$ m during the growing season (May-October) 2005, and $h = 13.1$ m, $d = 7.5$ m, and $z_0 = 1.32$ m during the growing season 2006. The h -value of investigated broken trees was 5.5 m. Similarly in Fs these parameters were: $h = 11.0$ m, $d = 7.0$ m, and $z_0 = 0.7$ m, and $h = 11.9$ m, $d = 7.0$ m, and $z_0 = 1.36$ m in 2005 and 2006, respectively. The h -value of broken trees was 4.0 m.

Winter's damages of forest impacts on airflow and aerodynamics characteristics differently due to several factors: meteorological factors, topographic factors, and forest stand characteristics.