Aerodynamic resistance of spruce forest stand in relation to roughness length and airflow

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Abstract: The aerodynamic resistance (r_a) of a young spruce forest stand was estimated during the course of a growing season 2001 on the basis of the vertical wind speed profile analysis. The measurements of r_a values were made at the Experimental Ecological Study Site at Bílý Kříž, Czech Republic (N 49° 30′ 17″, E 18° 32′ 28″, 800-900 m a.s.l.). This site is represented by the monoculture of 20 years age Norway spruce stand with the mean height $h = 8.86$ m and density of 2600 trees per ha in Fd plot and $h = 8.07$ m and density 1880 trees per ha in Fs plot. Plot areas cover is 2500 m^2 each. The aerodynamic resistance is the time for unit volume of air to exchange heat or water vapour with unit area of surface. This time depends partly on the wind speed and partly on the surface geometry. The mean dynamic roughness length (z_0) was 0.61 m in Fd and $z_0 = 0.69$ m in Fs plot. The aerodynamic resistance of a young spruce forest stand was determined using a simple method on the basis of vertical wind speed profiles analysis. The mean r_a value was 4.32 s m^{-1} in Fd plot, the maximum r_a value was 5.93 s m^{-1} in May and minimum 3.04 s m^{-1} in October. In Fs plot the mean value of r_a was 4.51 s m^{-1} and the r_a values were in interval of values (3.64, 5.60) s m^{-1}.

Key words: wind speed profile, aerodynamic resistance, zero plane displacement, dynamic roughness length, Norway spruce stand

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