



Formation and growth rates of atmospheric nanoparticles: four years of observations at two West Siberian stations

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In spite of fact that the first report on the new particle formation (NPF) itself was done by John Aitken more than one century ago (Aitken, 1898), a phenomenon of NPF bursts taken place in the atmosphere was discovered not very long ago. Nevertheless, to date it is known that they may occur quite often in a variety of environments (Kulmala et al., 2004; Hirsikko et al., 2011). Siberia occupies a vast area covered by forests, but the comprehensive data on burst frequency, as well as on formation and growth rates of freshly nucleated particles in this key region are still lacking. Continuous measurements of aerosol size distribution carried out in recent years at two West Siberian stations (TOR-station – 56°28'41"N, 85°03'15"E; Fonovaya Observatory – 56°25'07"N, 84°04'27"E) allowed this gap in data to be filled up.

Analysis of the size spectra classified in accordance with criteria proposed by Dal Maso et al. (2005) and Hamed et al. (2007) enabled a conclusion to be drawn that NPF events in West Siberia are more often observed during spring (from March to May) and early autumn (secondary frequency peak in September). On average, particle formation bursts took place on 23–28 % of all days. Such a seasonal pattern of the NPF occurrence is very similar to one observed at SMEAR II Station (Hyytiälä, Finland; Dal Maso et al. 2005, 2007).

Formation rates (FR) of particles with diameters below 25 nm varied in a wide range from 0.1 to 10 cm⁻³ s⁻¹. Mean values of FR for the entire period of observations were 1.7 cm⁻³ s⁻¹ (median = 1.13 cm⁻³ s⁻¹) at TOR-station and 0.88 cm⁻³ s⁻¹ (median = 0.69 cm⁻³ s⁻¹) at Fonovaya Observatory. Enhanced values of FR are usually observed from spring to autumn. Mean growth rates of observed at TOR-station and Fonovaya Observatory were 6.5 nm h⁻¹ (median = 5.0 nm h⁻¹) and 8.3 nm h⁻¹ (median = 6.4 nm h⁻¹), respectively.

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