Abstract

The aim for this diploma work was to measure size distribution of submicron aerosol and estimate its possible sources in a small village during winter. The measurement took place in the Mokre village with population of 160 inhabitants, between January 24 and February 7, 2008.

The five minute integrates of number/mass concentration of submicron aerosol in the range of 14.6 – 736.5 nm, PM_1 and $PM_{2,5}$, wind speed/direction, temperature, humidity and gaseous pollutants NOx and O_3 were determined during the sampling period.

Average / median of the number concentration was 4 242 / 3 472 #/cm^3. Average / median of the mass concentration was 16,2 / 11,9 μg/m^3. Four types of diurnal variation of submicron aerosol size distributions were distinguished within the sampling campaign: days with monomodal distribution mostly around 100 nm (caused by local heating,), days with bimodal distribution with maximum about 30 nm and 100 nm (caused by local heating and transportation), days with low number concentrations of submicron aerosol (due to rain) and days with new particle formation.

Formation of new particles occurred between 28-29 January 2008. Before the formation occurred, aerosol was washed out and due to temperature drop humidity decreased under 40 %. Nucleation burst started approximately at noon January 28 followed by condensational growth till near midday of the next day. As results, the highest number concentration of submicron aerosol was recorded within the first day, while the highest mass concentration was recorded during the second day. Of the 40 highest values of number concentrations (about 1 % of total count) 29 was recorded during the new particle formation days. The highest values of number / mass concentration occurred between 16:30 - 21:00 / 17:30 - 19:30. These time periods are also periods of the highest intensity of local heating. Maximum of mass concentration occurred at temperature between 0 – 4 °C and southeast wind of about 3 m/s speed. Maximum of number concentration occurred at wind speed about 3 m/s regardless the direction. Contrary to mass, aerosol number concentrations were found independent on temperature at 5 % level. Changes in continental airmass trajectories had no remarkable influence to submicron aerosol characteristic.

Based on our measurements, three main sources of submicron aerosol particles in the atmosphere of small village in winter were distinguished: new particle formation, local heating and transportation. Surprisingly, formation of new particles overrides sources of direct aerosol emission.