

Ultrafine aerosol and the first observed nucleation burst in Budapest

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Ultrafine aerosol plays an important role in urban environments as far as its health, climate and other environmental effects are concerned. A research was initiated to study the source processes, formation, growth, properties and effects of ultrafine aerosol particles at various places in Budapest including a kerbside, central urban sites, a tunnel and an urban background. On-line measurements have been performed using a differential mobility particle sizer (DMPS; Aalto et al., 2001) for determining particle number concentration in 30 bins in the 6–1 000 nm mobility diameter range, a tapered element oscillating microbalance (TEOM) for obtaining aerosol mass concentrations in the PM_{2.5} size fraction, and a mobile meteorological monitoring station for recording basic meteorological parameters. The time resolution of the measurements is about 10 min. The instruments were set up at the campus of the Eötvös University in central Budapest, Hungary near the river Danube, and they have been measuring continuously since 1 November 2008.

Number size distributions are inverted from the DMPS data, the size distributions are fitted by lognormal distributions using DoFit algorithm (Hussein et al., 2005), and time series are assembled from various derived quantities. Temporal evolution of and changes in the nucleation mode, Aitken mode and accumulation mode are utilized for classification the atmospheric processes and for identification of nucleation events.

The total number of particles in the measured size range varied from 1 300 to 71 000 cm⁻³ with a median value of 14 300 cm⁻³ for the winter season. The variability is related to micrometeorological conditions, emission and formation processes. Each day was classified into groups referred as banana type event, apple type even, non-event, featureless/undefined or missing/test data, and their occurrence was derived. Preliminary results show that new aerosol particle formation and consecutive growth (banana type nucleation) were only observed on three days. Time series for the size distribution and for the total particle number concentration for one day of them, i.e., for Saturday, 8 November 2008 are shown in Figs. 1 and 2, respectively. Relationships between the nucleation mode parameters and micrometeorological conditions have been investigated. Growth rate of the nucleation

mode particles was also determined and will be presented and further discussed.

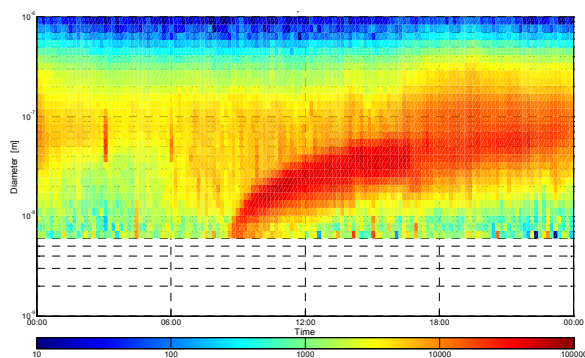


Figure 1. The first observed new particle formation event and consecutive growth in central Budapest on Saturday, 8 November 2008.

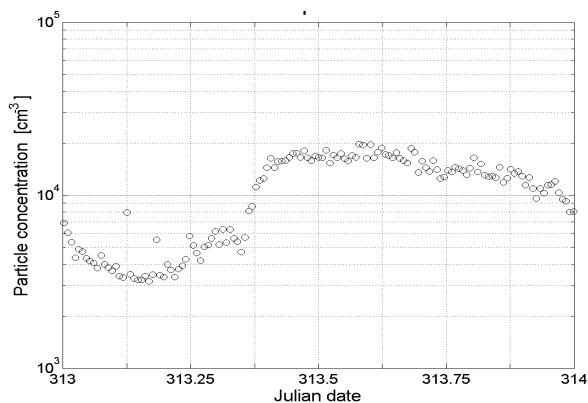


Figure 2. Diurnal variation of the total particle number concentration in the 6–1000 nm diameter range in central Budapest on 8 November 2008.

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