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Changes in sub-micron number size distributions at Czech rural and urban background stations in the last ten years

N. Zíková, J. Ondráček, Z. Wagner, V. Ždímal

Laboratory of Aerosol Chemistry and Physics, Institute of Chemical Process Fundamentals, Czech Academy of Sciences, Prague, 165 02, Czech Republic

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Presenting author email: zdimal@icpf.cas.cz

In the Czech Republic, long-term sub-micron measurement has been set up simultaneously at two background stations, almost ten years ago. The first station is Prague-Suchdol, an urban background station that started in 11/2007, the second is Košetice observatory, a rural background station starting its measurement in 4/2008.

The Prague-Suchdol measurement originally consisted of a commercial Scanning Mobility Particle Sizer (3034 TSI SMPS, details in Řimnáčová *et al.* 2011) until 11/2011. It was later upgraded at the TROPOS Institute to ACTRIS project (Aerosol, Clouds, and Trace gases Research Infrastructure Network) standards (Wiedensohler *et al.* 2012). New measurement started in 4/2012 and runs continuously with the exceptions of instrument calibrations etc. Size span, flows etc. can be found in Tab. 1.

The Košetice station is a professional meteorological station with multiple additional air quality measurements. The SMPS measurement was set up according to the EUSAAR/ACTRIS standards with the TROPOS-made SMPS system. Details about the measurement system can be found in (Zíková and Ždímal 2013), some information are also in the Tab. 1.

Table 1. Measurement details on Prague-Suchdol and Košetice SMPS systems.

	Prague	Košetice
dates	11/2007 - now	4/2008 - now
data availability		
size span [nm]	10 - 510	9 - 840
aerosol to sheath flow [lpm]	1:4 ± 5 %	1:5 ± 5 %

To make both datasets comparable, the data evaluation was done in a similar way for both stations (with the exception of the first four years in Prague, where original measurement program was used). As the size spans of the two instruments are different, for comparison total number concentration of particles between 10 and 450 nm was used.

The preliminary results show the total number concentrations increased from 2011 to 2016 in Prague-Suchdol, while the concentrations were decreasing from 2008 to 2011 and later stayed stable in Košetice (Fig. 1).

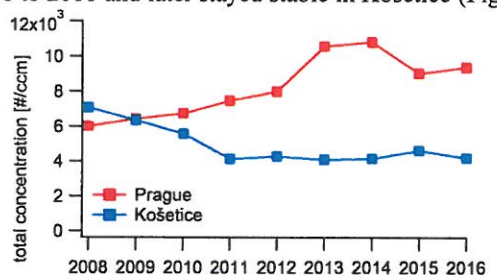


Figure 1. Total concentration from 10 to 450 nm from 2008 to 2016.

The daily cycles in Prague show two peaks, coinciding with the traffic, but from 2012, also a peak at midday, suggesting an increasing influence of new particle formation (NPF) events is evident. In Košetice, some influence of traffic pattern was observed at the beginning of the measurement, later the influence decreased (Fig. 2).

In this work, not only total concentrations are evaluated, but also particle number size distributions (PNSD) are compared in the last decade at the two stations, and possible explanations for the change in concentrations and PNSD changes are looked for. Additionally, also the change in the frequency and strength of the NPF events is evaluated.

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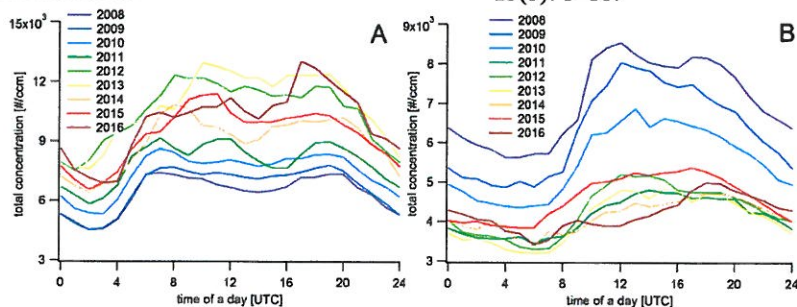


Figure 2. Daily cycles in Prague (A) and Košetice (B).