

# Characteristics of Local and Regional Nucleation Events at an Urban Background Site during Summer Period in Thessaloniki, Greece

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Keywords: PM, number size distribution, SMPS, nucleation events

Thessaloniki is a densely populated coastal city of northern Greece suffering from high concentrations of atmospheric particulate matter (PM). Previous studies have investigated the concentration levels, the chemical composition of PM, as well as the size distribution of particle mass concentrations and the relationship with PM mass, photochemical pollutants and meteorological parameters over the city (Voutsas *et al.*, 2002; Petrakakis *et al.*, 2007; Siakavaras *et al.*, 2008; Terzi *et al.*, 2010).

In this paper we report the characteristics of local and regional particle nucleation and growth events observed during the summer period. The measurements were carried out at Eptapyrgio: one of the urban background stations of the Municipality Air Quality network of Thessaloniki. A Scanning Mobility Particle Sizer (TSI, Model 3034) was employed to measure the size distributions of the particles having diameters in the range of 10–487 nm. An Integrating nephelometer (TSI, Model 3563) was also employed to measure the light scattering coefficient of the particles. PM<sub>2.5</sub> samples were collected on filters using a sequential sampler (Met One Instruments) for chemical characterization of the particles. Gaseous pollutants (CO, NO<sub>x</sub> and O<sub>3</sub>) and meteorological parameters (wind speed, wind direction, temperature and RH) were also recorded during the measurements. The experiments were conducted from 10 June to 20 July 2012.

Nucleation events were classified in 5 categories based on their intensity (Dal Maso *et al.*, 2005). Almost 50% of the days exhibited new particle formation. More specifically, 11% of the days were classified as class Ia events, 16% as class Ib, and 21% as class II. Days that exhibited no clear particle formation patterns and thus were considered as undefined accounted for 34% of the total number of measurement days, whereas days that showed no events accounted for the rest 18%.

During the nucleation event of the 18<sup>th</sup> of June the apparent growth of the particles started locally at the lower detection limit (10 nm) at ca. 11.00 am and evolved until the end of the day to a particle size of 100 nm at a growth rate of 6.9 nm/h (cf. Fig. 1a).

At 7 days nucleation started at particle sizes around 20 nm. This is the case at the 19<sup>th</sup> of July where nucleation started at a remote site and particles were transported to the measuring site (Fig. 1b). Particles

where detected at a size of 18 nm at 11:00 am and evolved until 15:00 pm to a size of 4 nm at a growth rate of 4.5 nm.

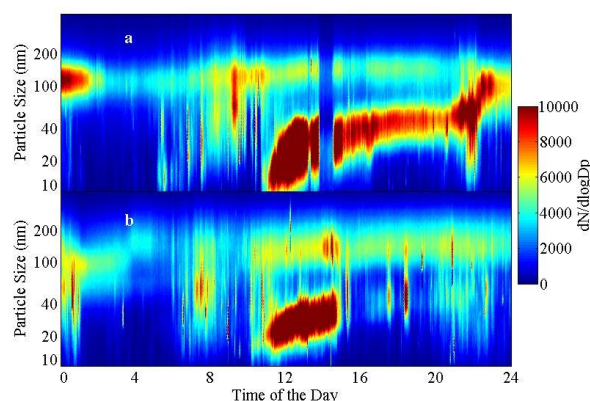


Figure 1. Typical number size distributions for a local particle formation and growth event on 18 June 2012 (a) and a regional particle formation and growth event on 19 July 2012 (b) at Eptapyrgio. On this day nucleation was transported to the site.

## Acknowledgements

The SMPS used in this study was obtained through the AKMON 5 Project.

Research co-financed by the ESF and Greek national funds - Research Funding Program: Heracleitus II.

Research co-financed by Greece and the EU through operational program Education and Lifelong Learning of the NSRF - Research Funding ProgrammTHALES: Investing in knowledge society through the European Social Fund.

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