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SMPS SPECTRA DEPENDENCE ON AIR MASSES ORIGIN AT KOŠETICE STATION

Naděžda ZÍKOVÁ^{1,2} and Vladimír ŽDÍMAL¹

¹Laboratory of Aerosol Chemistry and Physics, Institute of Chemical Process Fundamentals, Czech Academy of Sciences, zikova@icpf.cas.cz

²Department of Meteorology and Environment Protection, Charles University in Prague

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INTRODUCTION

The variability in atmospheric aerosol (AA) concentrations is considerable even at rural background stations with suppressed direct anthropogenic influence (Zíková & Ždímal, 2013), and strongly depends, among other meteorological parameters, on wind speed and direction. The wind direction, however, gives only limited information on the air masses origin, so the more detailed analysis of air mass trajectories was done to describe the variability of the AA at the Košetice station.

METHODS

Backward trajectories coming to the Košetice observatory at 06:00 between 1.5.2008 and 30.4.2013 were computed and analysed, using HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) model (Draxler & Rolph, 2013). The trajectories were computed 4 days back, i.e. -96 hours, based on the NOAA-NCEP/NCAR Reanalysis. According to the total spatial variance analysis, the trajectories were then clustered into 9 clusters.

For the description of the individual clusters, mainly in the means of synoptic origin, the clusters were compared with the synoptic types recorded for every day in the CHMI (Racko, 2014) according to the Catalog of 23 synoptic types for the Czech Republic (HMÚ, 1986).

The data were compared with the SMPS (Scanning Mobility Particle Sizer) measurements of particle number size distributions (PNSD) in the size range from 10 to 800 nm. For each of the clusters, the median of total number concentration was computed, as well as the median of concentrations in cumulative size classes. Typical PNSD for individual clusters were also computed, separately for night- and day-time, to separate the influence of New Particle Formation (NPF) events.

RESULTS

The lowest total concentrations were recorded during air masses from clusters 8 and 9 (Fig. 1 left), attributed to the clean marine air from Atlantic ocean not remaining too long time over continent, and thus not being strongly influenced by anthropogenic emissions. The highest concentrations were measured in the air masses from clusters 3, 4, and 7, consisting of trajectories coming from east to north, mainly over the land.

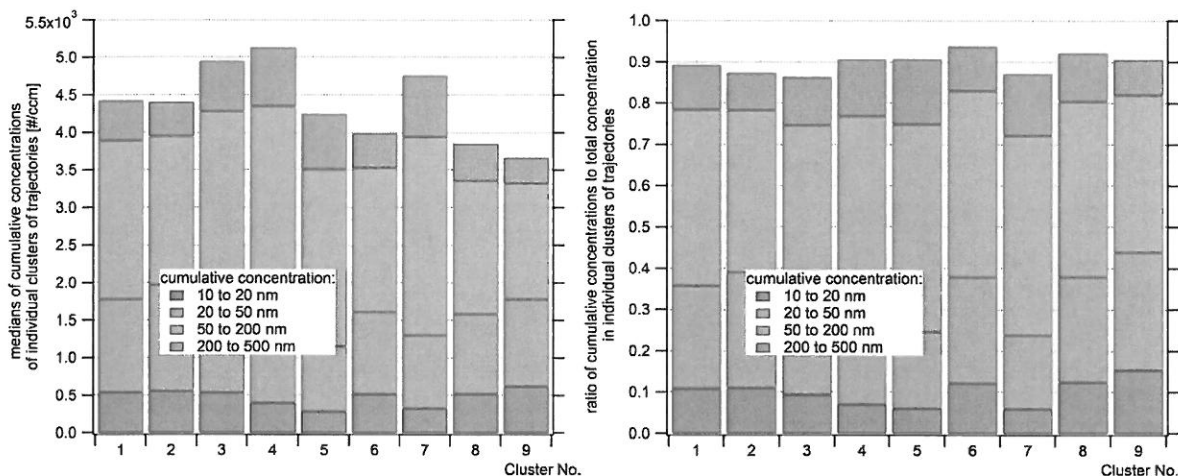


Figure 1. Left: Cumulative concentrations in the individual clusters. Right: Ratio of cumulative concentrations to total concentration in the cluster.

Considering the concentrations of the nucleation mode particles, the cluster 9 shows the highest numbers, and also the highest ratio of the nucleation mode concentrations to total concentration (Fig. 1 right). It is the consequence of high number of NPF events in the air masses of this cluster. The lowest concentrations of nucleation mode particles were found in the cluster No.5; the nucleation mode is responsible only for 6 % of total concentrations. The highest concentrations of particles of Aitken mode were measured in the air masses from clusters 2 and 9. Both of the clusters are connected with anti-cyclonic situations, bringing air masses from southeast. The air masses contain aged aerosol, with main share of aerosol particles in accumulation and droplet modes.

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