ON OUR RECENT WORK IN STUDYING NEW PARTICLE FORMATION (NPF)

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Jiří KOVÁŘÍK[1], Anna ŠPALOVÁ[1], Petr ROZTOČIL[1], Naděžda ZÍKOVÁ[1,2,3], Jaroslav SCHWARZ[1], Vladimír ŽDÍMAL[1,3]

[1] Institute of Chemical Process Fundamentals, AS CR, Prague, Czech Republic, icecas@icpf.cas.cz
[2] Institute for Environmental Studies, Faculty of Science, Charles University, Prague, Czech Republic, uzp@natur.cuni.cz
[3] Department of Atmospheric Physics, Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic, kfa@mff.cuni.cz

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INTRODUCTION

New particle formation (NPF) is increasingly gaining attention since it emerged roughly twenty years ago as a field of interest within the aerosol science. It studies the transition process between gas phase molecules, forming clusters and eventually becoming aerosol particles. Thus, this field is a multidisciplinary one, ranging from meteorology, atmospheric chemistry and physics, all the way through physical chemistry towards chemistry and physics of aerosols.

Recent development of instrumentation techniques allows measuring of sub-5 nm particles and molecule clusters, neutral and also charged ones. Therefore, modern analytical methods based on these measurements are often used for NPF studies.

EXPERIMENTAL SETUP

For this kind of studies we deployed a Neutral cluster and Air Ion Spectrometer (NAIS, manufacturer: Airel – Tartu, Estonia, type: 5_28) measuring the size and mobility of aerosol particles and ions in the atmosphere.

NAIS is a parallel multichannel aerosol spectrometer measuring the mobility distribution of ions (from 3.2 to 0.0014 $cm^2/V/s$, from 0.8 to 40 nm size equivalent) and size distribution of aerosol particles (from 2 to 40 nm) with a maximum time resolution of 1 second (Fig. 1).

NAIS is based on the principle of parallel differential mobility analysis. The instrument is easy to deploy, operate and maintain. It can measure for long periods without requiring human attention and works well in a wide range of environmental conditions: from polluted downtowns to clean forests, on mountaintops, and onboard aircraft.

We deployed the NAIS at National Atmospheric Observatory in Košetice (NAOK) for a trial run between April 3rd and May 12th this year and then again after an intercomparison workshop in Finland within ACTRIS. Since June, NAIS is operated continuously.

There are only about 10 to 20 NAIS devices currently deployed in the whole Europe so our group has a possibility to be amongst the pioneers in this recently growing field of interest within the aerosol science.

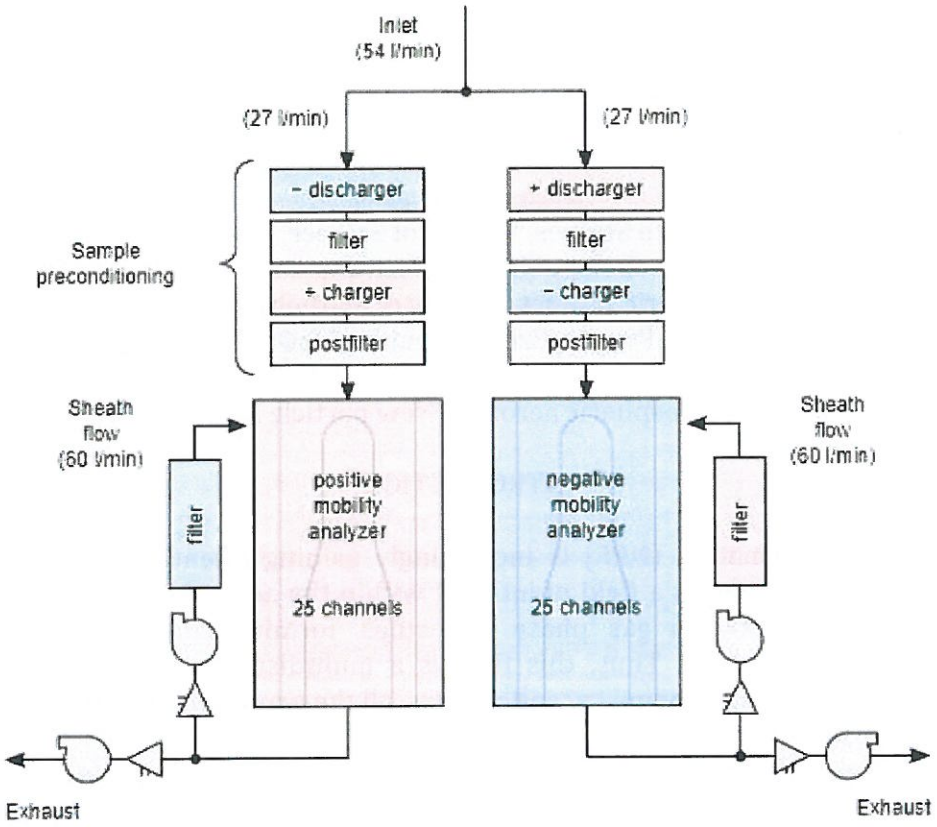

Fig. 1: NAIS primary component and airflow scheme.

RESULTS AND CONCLUSIONS

Results obtained using above mentioned analytical method will be evaluated with regard to meteorological parameters, mainly atmospheric conditions like temperature, atmospheric pressure, relative humidity, intensity of solar irradiation and gradient of wind speed and direction. NPF will be also evaluated with regard to daily cycles.

We hope that in the near future, we will obtain more instruments to expand the amount of measureable variables. We would like to deploy another NAIS at 230 metres on atmospheric tower's measurement platform. At higher altitude above the Earth's surface, aerosol constitution and thus also NPF is significantly influenced by long-range transport.

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