

Name of research institute or organization:

Institut für Atmosphäre und Umwelt, Goethe-Universität Frankfurt/Main

Title of project:

Study of ultrafine particle concentrations and nucleation events

Part of this programme:

NUCLACE campaign, coordinated by PSI

Project leader and team:

Prof. Joachim Curtius, project leader
Christina Williamson, Steffen Münch

Project description:

Two ultrafine particle counters (uCPCs) were deployed between 13 January and 28 March 2014 as part of the NUCLACE experiment to study aerosol nucleation events at the Jungfraujoch research station. The two counters are operated with diethyleneglycol (DEG) as the working fluid and they allow to detect and quantify aerosol particles at sizes smaller than 3 nm. The two counters are operated with different cut-off limits (the aerosol particle size for which 50% of the particles are counted, larger particles are counted more efficiently) of $d_{p50} = 1.5$ and 2.1 nm, respectively. During more than two months of continuous deployment we identified about 10 nucleation events, typically starting in the late morning and lasting several hours. An example of a pronounced event as observed on 11 February 2014 is displayed in Figure 1. Typical background CN concentrations at JFJ are less than 1000 particles cm^{-3} , as characteristic for the free troposphere without nucleation happening. During the day of 11 February both counters show a continuous rise to concentration levels of $>10\,000$ particles cm^{-3} . The counter with the 1.5-nm cut-off starts detecting the nucleation event earlier and the difference between the two counters is indicative of the number of freshly nucleated particles with sizes between 1.5 and 2.1 nm. Nucleation rates were derived from the measurements, ranging between 0.1 and 2 particles $\text{cm}^{-3} \text{s}^{-1}$. The data evaluation and interpretation is ongoing and the displayed data are still preliminary. Our measurements complement the comprehensive data set of the NUCLACE campaign. The data will form a valuable contribution to a refereed journal presentation that is currently being prepared under the lead of the Paul Scherrer Institute (Bianchi et al., in preparation).

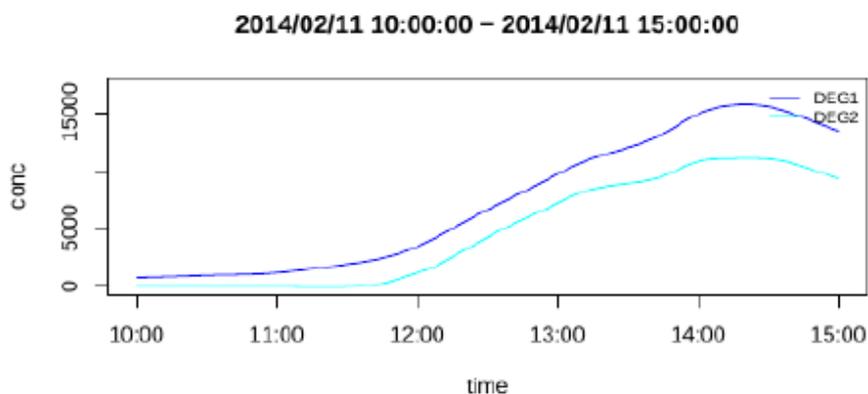


Figure 1. Example of a pronounced aerosol nucleation event as observed with the two DEG-uCPCs that are counting all particles >1.5 nm (DEG 1) and all particles >2.1 nm (DEG2). The difference between the two counters gives the concentration of particles in the 1.5 to 2.1 nm size range.

Key words:

Aerosol nucleation, ultrafine particle concentration, free troposphere

Collaborating partners/networks:

Paul Scherrer Institute, Switzerland
University of Helsinki, Finland

Address:

Institute for Atmospheric and Environmental Sciences
Goethe-University Frankfurt am Main
Altenhöferallee 1
D-60438 Frankfurt am Main
Germany

Contacts:

Prof. Joachim Curtius
Tel.: +49 69 798 40258
Fax: +49 69 798 40262
e-mail: curtius@uni-frankfurt.de
URL: <http://www.uni-frankfurt.de/43267299/AG-Experimentelle-Atmosphärenforschung>