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Aerosol microphysics during anticyclonic conditions over Europe during EUCAARI-LONGREX

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Airborne measurements of tropospheric aerosol properties over Europe were conducted in May 2008 during the EUCAARI-LONGREX campaign, where LONGREX stands for "LONG Range EXperiment". 15 research flights were performed with the DLR Falcon 20, of which most flights were coordinated with research flights performed by the FAAM BAe-146. Both aircrafts operated from Oberpfaffenhofen (48.08° N, 11.28° E). The flights of the FAAM BAe-146 were mainly conducted in the boundary layer and lower free troposphere, whereas the flights of the DLR Falcon 20 focussed on the free troposphere up to the tropopause level and on obtaining an extensive set of vertical profiles. The vertical profiles performed by the DLR Falcon 20 cover a large part of Central Europe. In-situ measurements of aerosol properties were also performed in the vertical tropospheric column over EUSAAR ground sites like Melpitz and Cabauw.

DLR Falcon 20 aerosol data used for the analysis were measured by a set of Condensation Particle Counters (CPC), a thermodenuder at 250° C, two aerosol spectrometers by Grimm, two further optical particle counters, the Passive Cavity Aerosol Spectrometer Probe (PCASP-100X) and the Forward Scattering Spectrometer Probe (FSSP-300) and one Particle Soot Absorption Photometer (PSAP). More detailed information about the instrumentation can be found in Petzold *et al.*, 2007.

During the first part of the campaign a blocking anticyclone occurred over Central Europe with its core mainly situated over Denmark. This stable synoptic situation leads to accumulation of anthropogenic emissions in the continental boundary layer and westward transport of air masses across Northern Germany and South of England towards the Atlantic. Aerosol microphysical properties were measured in almost unpolluted air masses over the Baltic Sea advected from Scandinavia as well as in air masses within the anticyclone over Central Europe and the Atlantic.

Most measurements of accumulated and transported emissions showed a high fraction of non volatile particles within the total particle number concentration, up to almost 100 % in the boundary layer and lower troposphere. In contrast to this, the volatile fraction of the total volume of PM2.5 reaches 95 % as shown in Figure 1. This indicates an internally mixed aerosol with a high load of condensed and accumulated volatile material with a non volatile core.

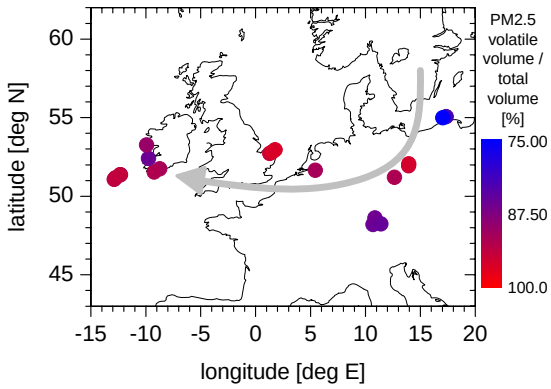

Figure 1. Aerosol properties during the May 2008 anticyclone. The colour indicates the volume fraction of volatile material of PM2.5 aerosol. The main transport direction is shown by the grey arrow.

The extensive data set obtained during EUCAARI-LONGREX within the stable synoptic situation over Europe combined with an analysis of the meteorological situation during air mass transport allows studies of aerosol microphysical properties during transformation and aging of anthropogenic emissions. These studies will also provide an important input to aerosol models. The main highlights of this analysis will be presented on the EAC 2009.

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Petzold, A., et al. (2007). *Atmos. Chem. Phys.*, 7, 5105-5127.