# Nitrate and the regional Indirect Aerosol Effect

H.M. ten Brink, R. Otjes, P. Jongejan
Netherlands Energy Research Foundation (ECN), P.O. Box 1, 1755 ZG Petten, The Netherlands

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The Indirect Aerosol Effect (IAE) has a maximum in coastal regions like The Netherlands (Roelofs, 2006). The responsible manmade CCN are thought to be dominated by the component sulphate. The concentration of sulphate is drastically declining at the moment and as a consequence the regional IAE should fade out.

The projection of a drastic decline in the IAE can be erroneous, because manmade nitrate may be an important CCN-agent. Moreover, it is projected that its decrease is much less than that of sulphate.

The number of data on nitrate in the CCN-range in our region is limited and the values are often underestimates, because evaporative losses of nitrate occur during sampling.

We investigated the possible role of nitrate as CCN-agent in a process study in our cloud-chamber, of which the results were presented at EAC2008. We concluded that nitrate was present and often dominant in the particles that act as CCN, especially at the low super saturations occurring in the stratocumulus clouds that are most relevant for the IAE.

Most of the particles that activated in our cloud chamber had a size in a narrow range of 120 to 200 nm mobility diameter. This range corresponds to an aerodynamic diameter range of approximately 160 to 280 nm, assuming a (dry) particle density of 1.6 g cm-3.

Longer-term data that can be combined with other aerosol characteristics were absent in our process study. For that reason we performed a year-long monitoring

**Monitoring study**

We deployed our new monitor, the MARGA-sizer. This instrument allows representative sampling of the semi-volatile ammonium nitrate. The aerosol is size-classified before sampling in a number of (aerodynamic) size fractions.

Monitoring took place during the whole year 2008, encompassing the EUCAARI-campaign in May. The sampling occurred at ground level of the meteo-observation tower of CESAR at Cabauw in the centre of the country.

As sampling line a 2 meter Teflon-tubing was used, in which evaporation of the semi-volatile ammonium nitrate is negligible.

To put the concentration of nitrate in perspective we compare its concentration with that of sulphate, which is also measured with the instrument.

We present here the data obtained in that month. Not only a MARGA-sizer was deployed, but also a standard MARGA, with a better time-resolution was operated. This latter instrument measures the same components without size-classification. This helped in improving the quality of the size-fractionated data.

The size-range that corresponded best with the one in which probably the most numerous CCN reside is that between 180 and 320 um (aerodynamic diameter). For that reason we provide the concentration of nitrate in that size range here, in figure 1.

To appreciate the importance of nitrate also the concentration of sulphate in the same size-range is shown. Noticeable is the much larger variations in the concentration of nitrate which is a characteristic that is also found for the rest of the year.

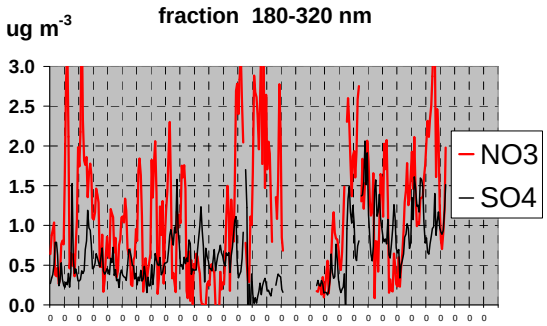


Figure 1. Concentrations of the indicated components in the “CCN-range” during the month of May at the CESAR-site of Cabauw, in the centre of the Netherlands.

In addition to the composition there are data on the CCN-concentration and of the size-spectra in 2008 obtained by partners in the CESAR-consortium. These data should be jointly evaluated to further assess the importance of nitrate as regional CCN-component.

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Roelofs, G.J. (2006) *Simulation of the anthropogenic influence on CDNC over Europe. http://www.phys.uu.nl/~roelofs/werk/pdf_papers/roelofs_accent.pdf*