

On the Importance of Nitrate as IAE-Agent in West-Europe

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Background

- Current belief: sulphate is the dominant component in CCN in W-Europe
- Recent monitoring shows a large contribution of nitrate in the CCN-range
- Needed is proof on the actual number of CCN containing nitrate

Approach

The activation of nitrate is assessed in the ECN cloud-chamber (fig. 1). NOTE its size.

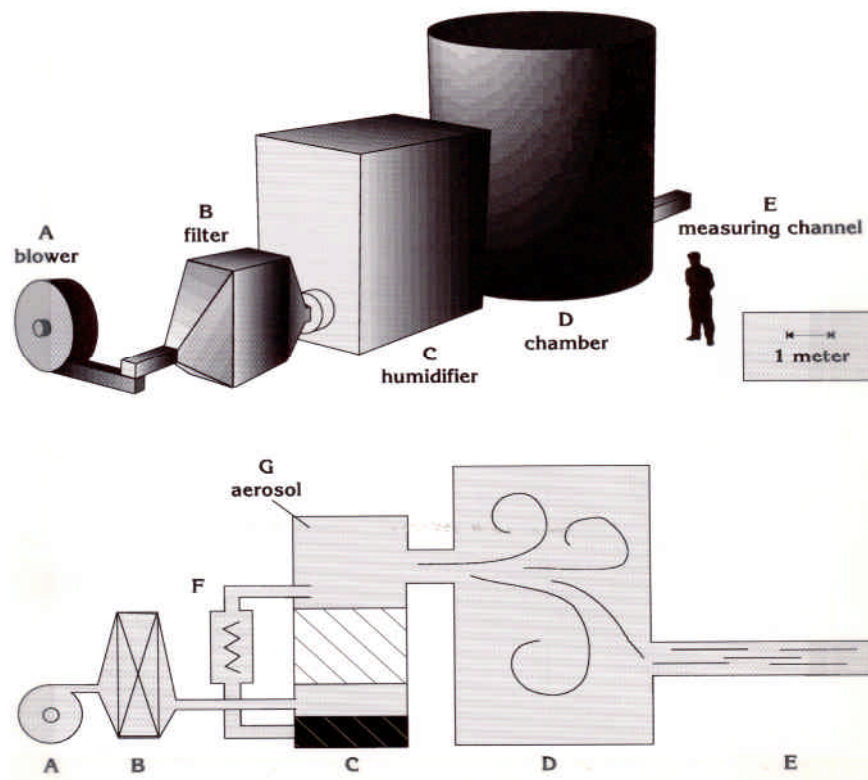
- The cloud-chamber is operated at super-saturations simulating that of local marine stratocumulus
- Stratocumulus is the most important type of clouds for the IAE (~0.1 %)
- The chamber is at a relevant marine site for such a study: at the coast of the North-Sea.

Operational principle

Ambient air is humidified and heated before entering the cooler chamber; as a result droplets form.

Fig. 1

SCHEMATIC VIEW OF THE ECN CLOUD CHAMBER



Experiments

- The number of **droplets** formed in the chamber is measured
 - The **aerosol spectra** are measured before and after the chamber
- Difference in aerosol numbers before and after should equal the number of cloud droplets formed.

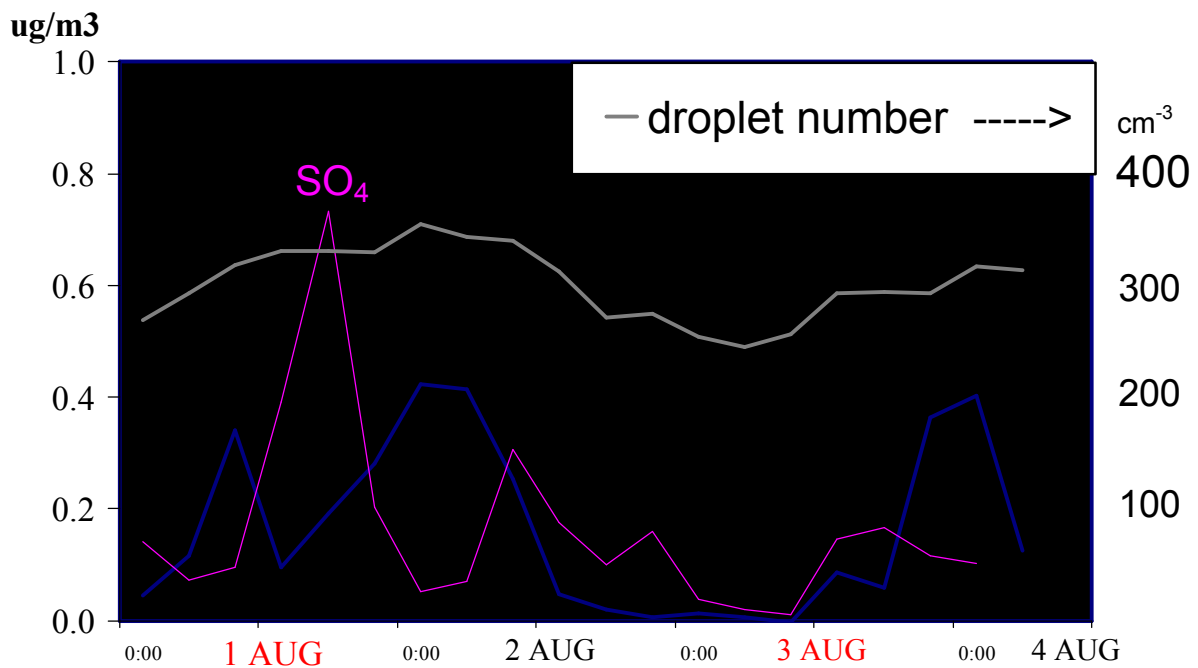
Nitrate and sulphate are determined BEFORE and AFTER the chamber;
they are automatically measured with a MARGA-sizer in “MOUDI”-size classes.

The **difference** in aerosol spectra and corresponding compounds provides the activation efficiency.

Results

- Nitrate** is present in “**polluted air**”. It forms as many droplets as sulphate, see fig. 2.
- Sulphate** dominates in “**clean air**”.

Figure 2
Concentration of nitrate and sulphate in the particle-fraction of the CCN
Note: the droplet number saturates at 350 cm^{-3}



First conclusion

We present evidence that (manmade) **nitrate** is an important component of the regional CCN
The component thus significantly contributes to the regional IAE.

This hypothesis is supported by data on the very fine size and abundance of nitrate in neighbouring countries.