Geophysical Research Abstracts, Vol. 8, 02872, 2006
SRef-ID: 1607-7962/gra/EGU06-A-02872

Interaction of ageing aerosol with stratocumulus

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The interaction of ageing aerosol emitted from urban areas of the UK was investigated as the plumes advected away from the area over the sea in a stratocumulus capped boundary layer. Detailed measurements of the size distribution and chemical composition of the aerosol were made on the UK community's new research aircraft a BAE 146. These measurements were complimented by detailed measurements of the liquid water content and cloud microphysics. Detailed measurements of precursor trace gases were also made by colleagues from the University of York and the University of East Anglia, these will be presented separately.

The aircraft made a series of horizontal passes perpendicular to the line of the plume below cloud, within the cloud deck and above the cloud top. This series of passes was repeated at 50 km intervals moving downwind from the source. Within cloud an airborne CVI was used to separately measure the interstitial and droplet residual aerosol components to investigate the nucleation scavenging of the particulate.

A key measurement of the aerosol size resolved composition was made using an Aerodyne Aerosol Mass Spectrometer. This instrument is able to provide size resolved information of the semi volatile components of the aerosol including major ions and organic material. Some information is available on the main functional groups in the organic material and the state of oxidation.

The changing chemical composition, size distribution and nucleation scavenging of the aerosol will be presented as the aerosol ages. The result swill be compared with results from other field projects in which we have participated during CLACE (in a mountain cap cloud) and during ACE-ASIA. It is generally found that as the aerosol ages then the organic component becomes more highly oxidized developing a fulvic

acid like structure and the sulphate loading in the aerosol increases at the expense of nitrate. Evidence exists of a high scavenging efficiency in cloud of the organic component early in the plume evolution.

The results will be discussed using a detailed process model of the hygroscopic and cloud nucleating properties of mixed organic and inorganic aerosol developed by Topping and McFiggans.