Single particle analysis of aerosols and cloud residues in the Arctic troposphere

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The compositions of individual cloud residue and interstitial aerosol particles collected in the north of Scandinavia during POLARCAT 2008 spring campaign were investigated. Aerosol particles as well as residues from various clouds (ice, liquid or mixed phase) extracted by an aircraft borne Counterflow Virtual Impactor (CVI), were analyzed on individual particles basis under both Scanning and Transmission Electron Microscopes coupled to Energy Dispersive X-ray detectors (SEM- and TEM-EDX). The supermicron residues of clouds containing ice crystals tended to show larger contribution by clay-like mineral dust, while marine particles gained relative importance within the lower liquid phase clouds, indicating their distinct interactions with the Arctic clouds. Submicron Biomass Burning (BB) particles (enriched in Potassium and often internally mixed with soot) were characteristically found in polluted air-mass in the Arctic troposphere. Such BB particles were also extracted from liquid phase clouds but not as frequently from ice phase clouds. On the other hand, mineral dust, bare soot, flyash and K-rich marine particles dominated the submicron ice cloud residues. These results suggest that the BB particles may be efficient Cloud Condensation Nuclei (CCN) but their internal mixing can delay or inhibit the ice nucleating properties of bare soot particles. Current study highlights the active transport of continental particles and their interaction with the Arctic clouds.