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# Chemical compounds of past soluble aerosols preserved in the NEEM and Dome Fuji ice cores

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We will present a study on chemical compounds of past soluble aerosols preserved in the NEEM and Dome Fuji (DF) ice cores. We have developed a new method, called the 'ice sublimation method', for detecting large amounts of aerosol particles in polar ice cores #1. The elemental components of detected single particles were measured by SEM-EDS, and then chemical compounds of each single particle are obtained such as insoluble dust, soluble sulfate salts, and soluble chloride salts. We have applied this sublimation method to the NEEM and DF ice cores in order to compare chemical compounds of past aerosols during Holocene and Last Glacial Maximum (LGM) in Arctic and Antarctic regions.

The results showed that the primary soluble aerosols are sodium sulfate during Holocene #2, and sodium sulfate, calcium sulfate and sodium chloride during LGM #1 in the DF ice core. On the other hand, soluble aerosols in NEEM core is more chloride rich (less sulfate) than that of the DF core. The chloride rich aerosols in NEEM ice core indicate that sea salt in Arctic atmosphere is likely to survive against oxidation from nitric and sulfuric acid.

During LGM in the NEEM core, there are many particles of 1) coexistence of dust, sulfate salt, and chloride salt, and of 2) calcium chloride. The coexistence is a result of both sulfate and chloride salts formation on/in dust by attached from hydrochloric and sulfuric acid. Calcium chloride is secondary aerosol, and is probably formed by chemical reaction in atmosphere of calcium carbonate and hydrochloric acid. Hydrochloric acid is also a reacted product from sea salt and strong acid (nitric and sulfuric acid). The existence of these particles implies that multiple chemical reactions occurred in the Arctic atmosphere during LGM.

#1: Iizuka et al., 2009 Constituent elements of insoluble and non-volatile particles during the Last Glacial Maximum of the Dome Fuji ice core. J. Glaciol., 55, 552-562.
#2: Iizuka et al., 2012 The rates of sea salt sulfatization in the atmosphere and surface snow of inland Antarctica. J. Geophys. Res. In press