

グリーンランド NEEM 氷床コアに含まれる微粒子の化学組成

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Chemical compositions of solid particles present in the Greenland NEEM ice core

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The chemical composition of particles preserved in the polar ice sheets is important for the understanding of past atmospheric chemistry. However, only a few studies have directly measured the chemical composition of particles preserved in Greenland ice cores. This study reports the chemical composition of particles present along Greenland's North Greenland Eemian Ice Drilling (NEEM) ice core, back to 110,000 years before present. Insoluble and soluble particles larger than 0.45 μm were extracted from the ice core by ice sublimation and their chemical composition was analyzed using scanning electron microscope and energy dispersive X-ray spectroscopy and micro-Raman spectroscopy. We show that the dominant insoluble components are silicates, whereas NaCl, Na₂SO₄, CaSO₄, and CaCO₃ represent major soluble salts. The chemical speciation of salts varies with past climatic conditions. Whereas the fraction of Na-salts (NaCl + Na₂SO₄) exceeds that of Ca-salts (CaSO₄ + CaCO₃) during the Holocene (0.6–11.7 kyr BP), the two fractions are similar during the Bølling-Allerød period (12.9–14.6 kyr BP). During cold climate such as over the Younger Dryas (12.0–12.6 kyr BP) and the Last Glacial Maximum (15.0–26.9 kyr BP), the fraction of Ca-salts exceeds that of Na-salts, showing that the most abundant ion generally controls the salt budget in each period.