

Seasonal variations of snow chemistry at EGRIP, Greenland

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This study observed two pits with depths of 4.02 and 3.18 m at the EGRIP (East Greenland Ice Core Project) camp (75° 37' N, 35° 59' W), Greenland in summer of 2016. The purpose of the study was to examine seasonal variations of major ion species, stable isotopes of water and microparticles (dust) in the snow samples. Dating using clear seasonal variations of profiles in the stable oxygen and hydrogen isotope ratios and some ions concentrations indicated that the 4.02 and 3.18 m deep pits included snow depositions corresponding to ten years from 2006 to 2016 and seven years covering 2009 to 2016, respectively. Concentration profiles of K⁺, NH₄⁺, SO₄²⁻, Cl⁻, Na⁺, Mg²⁺, Ca²⁺ and dust in our snow pits had annual maximum peaks between winter and next summer season. Profiles of NO₃⁻ concentration and Cl⁻/Na⁺ ratio showed maximum peaks in the summer layers, while pH values were relatively low. These seasonal trends at the EGRIP were similar to those observed at other sites in Greenland ice sheet. The annual summer peaks of Cl⁻/Na⁺ ratio in our pits were much higher than those at other sites in Greenland. This suggested that the snow at the EGRIP received remarkable non-sea salt Cl⁻ contributions which were derived from anthropogenic emissions or gaseous HCl.