5.146 The effect of slope and elevation on ion characteristics for Arctic precipitation .

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Abstract:

Both organic compounds and sulfate have been shown to be important in the formation and growth of aerosols in remote locations. How these compounds and aerosols contribute to properties of clouds and precipitation, particularly in the Arctic, is of considerable interest in light of their effect on the radiation balance. Sulfate, sea salt and methanesulfonic acid and their role with respect to precipitation formation, and ion deposition is explored across two contrasting steep and shallow elevation transects on Ellesmere Island in the high Arctic. Anion and cation concentrations, snow water equivalent, and isotope apportionment were used to explore the relationship between crustal, sea salt and anthropogenic sources of ions and to qualntify ion flux. Chloride can be lost when sea salt aerosols become acidified during long range transport but the effect, even at elevations as high as 1450m, was minor and suggests both sodium and chloride are appropriate tracers for sea salt. High ion concentrations in fresh snow in April contrasted with cleaner snow at depth representing a seasonal cycle in ion flux coincident with Arctic Haze. A clear correlation between snow $d^{18}O$ values and methanesulfonic acid concentrations was found. Relationships between snow formation temperatures, methanesulfonic acid and biogenic sulfate are explored and contrasted across the transects and with snowpack depth.