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Characterization of the size-segregated water-soluble inorganic ions across eastern Canada

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Size-segregated water-soluble inorganic ions including particulate sulphate (SO_4^{2-}), nitrate (NO_3^-), ammonium (NH_4^+), chloride (Cl^-) and base cations (K^+, Na^+, Mg^{2+}, Ca^{2+}) were measured using a micro-orifice uniform deposit impactor during fourteen short-term field campaigns at eight locations covering polluted and remote regions of eastern Canada. The size distributions of SO_4^{2-} and NH_4^+ were unimodal, peaking at 0.3-0.6 μm in diameter, during most campaigns. The size distributions of NO_3^- were bimodal during many campaigns, with one peak at 0.3-0.6 μm and another at 5-6 μm. A unimodal size distribution peaking at 4-6 μm was found for Cl^- and base cations (except K^+) during about half number of campaigns and a bimodal distribution (one peak at 2 μm and the other at 6 μm) was found during the rest campaigns. For K^+, a bimodal distribution with one peak at 0.3 μm and the other at $\sim$4 μm, was observed during most campaigns. The measured ions' concentrations varied by one order of magnitude across the region. Back trajectory analysis suggested that the air-mass origins, local sources and meteorological conditions all play important roles on the observed geographical and season patterns of these ion species' concentration levels and their size distributions.