Identifying sources of Cl^- to inland streams of southwestern Nova Scotia using chlorine stable isotopes.

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Abstract

Chloride fluxes from streams of interior southwestern Nova Scotia are significantly and consistently greater than input from precipitation alone. Identifying and quantifying the sources of excess chloride has implications for sulphate budgets and understanding anthropogenic contributions to acidification of fresh water. A study of chlorine stable isotope ($\delta^{37}Cl$) and ionic analyses provides new information used to investigate contributions of marine advective fog, precipitation, soils and bedrock to streams 60 km from the ocean. Chlorine stable isotope analyses are reported relative to standard mean ocean chloride (SMOC) as $\delta^{37}Cl$. Samples exhibit a range from -1.92‰ to +2.3‰ with a total precision better than 0.26‰ (1 σ). Stream water samples from two watersheds display a range from -0.5‰ to -1.5‰. Precipitation values cluster in a range from -1‰ to -2‰. The $\delta^{37}Cl$ values of marine advective fog have a range from -1.71‰ to -0.21‰. Water soluble soil chloride (soil solution) from B and C horizons exhibit $\delta^{37}Cl$ values in the same range as precipitation. Silicate decomposition of mineral bound chloride in three soil samples yields $\delta^{37}Cl$ values from -0.96‰ to +0.35‰. Mineral bound chloride from three bedrock samples (biotite greywacke and two of biotite monzogranite) exhibit values from -0.20‰ to +2.3‰. Ionic and isotopic results confirm precipitation is not an exclusive source of chloride in stream water.