

"Elemental Composition of Washout Particulates in NADP Samples by Instrumental Neutron Activation Analysis"

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Washout particulates were analyzed from weekly wetfall samples collected by the National Atmospheric Deposition Program (NADP) at four sites in the Rocky Mountains and three sites in the Great Lakes region during December from 2010 – May 2011. The NADP Central Analytical Laboratory collected filters (0.45 microns) used to process weekly wetfall- samples. The U.S. Geological Survey (USGS) composited the filters by month and site in polyethylene capsules for Instrumental Neutron Activation Analysis (INAA). USGS irradiated the filters with neutrons in the TRIGA¹ research reactor, and then analyzed them by gamma spectrometry to estimate mass of identified elements after blank correction.

Results indicate washout elemental relative abundances are generally consistent with relative crustal abundance with subtle regional differences. Elements of atomic number less than Na are not measurable, and Ca and S, are not easily measured by INAA.

<i>Region & NADP Sites</i>	<i>Elements Identified and Relative Abundance</i>	<i>Sampling Period Flux Range (grams/m²)</i>
<i>Rocky Mountains</i>	<i>K>Na>Cl>Cr>Mn></i>	<i>10⁻¹ - 37</i>
<i>CO92, CO93, CO96, WY95</i>	<i>Al>Cd></i>	<i>10⁻² - 10⁻¹</i>
	<i>Ba>Xe>Fe>As>Br>Cu>Zn>V>W>Sb>Ce>La</i>	<i>10⁻⁵ - 10⁻²</i>
	<i>Cs>Co>Zr>Mo>Hg>Sc>Ru>Ag>Eu>Au>Sr</i>	<i>10⁻⁸ - 10⁻⁵</i>
<i>Great Lakes</i>	<i>K></i>	<i>1.5 - 31</i>
<i>IN34, MI09, MI99</i>	<i>Na>Mn>Cl>Cd>Ba>Cr>Al ></i>	<i>10⁻² - 1.5</i>
	<i>Fe>As>Zn>Br>W>Cu>Ce>V>Sb</i>	<i>10⁻⁵ - 10⁻²</i>
	<i>Ru>Cs>La>Sc>Hg>Mo>Eu>Se>Ag>Au</i>	<i>10⁻⁸ - 10⁻⁵</i>

Elemental enrichment factors indicate potential anthropogenic sources. (EF) were calculated for most elements as: $EF = \frac{(X/C)_{atmospheric}}{(X/C)_{crustal}}$, where *X* and *C* are relative

abundances of elements of interest and a reference element, in this case Na (EF:Na)², respectively. EF:Na values ranged from 2 to 8,874 for selected elements. The highest EF:Na values for As, Cl, Cu, and Mn were observed during December 2010 for IN34, which is located downwind of industrial centers in Chicago, IL and Gary, IN.

Measurement of particulate Hg on NTN filters using INAA offers a practical and inexpensive method to augment Hg speciation data at NTN sites co-located with Mercury Deposition Network and Atmospheric Mercury Network sites. Hg-associated particulates in washout are of interest because this phase of Hg speciation is not well characterized. Monthly particulate Hg deposition ranged from 0.04 to 7.5 µg/m².

¹Use of trade of firm names is for identification only and does not constitute endorsement by U.S. government.

²Landsberger S., Jervis, R.E., and Monaro, S., 1985, Trace analysis of wet atmospheric deposition by nuclear methods, in J.F. Lawrence, ed., Trace Analysis, vol. 4, Academic Press, Inc., Orlando, FL.