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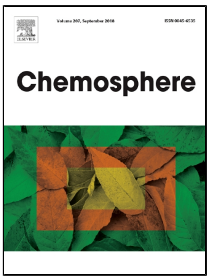

Trace Elements in Atmospheric Wet Precipitation in Detroit Metropolitan Area: Levels and Possible Sources

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Abstract

Rain and snow samples were collected in the Detroit metropolitan area and analyzed by inductively coupled plasma–mass spectrometry (ICP-MS). Twenty-two elements were detected in a concentration range from ~0.03 to ~1.8x10^3 μg/kg. An enrichment factor (*EF*), defined as, $EF = \frac{(X/Al)\ sample}{(X/Al)\ crust}$, was estimated for each element (*X*) detected, and used to determine the possible origins of the element. Based on the hypothesis that crustal material is the only source of aluminum (Al) found in the environment, an *EF* value near unity for an element suggests that crustal material is a major source of this element. If *EF*>10, an element is enriched in the atmosphere relative to its concentration in the earth's crust, implying a source other than the crust. Alkali, alkaline earth and lanthanide elements exhibit low *EF* values, indicating mainly a crustal source. Six elements (Cu, P, As, Zn, Cd and Pb) were significantly enriched in the atmospheric wet deposition as their *EF* values were greater than 10, thus originated likely from anthropogenic emissions. The relative order of the moderately and highly enriched elements is estimated as follows:

Cd > Pb > Zn > As > Cu > P

A high enrichment (*EF*~100) for phosphorus was caused plausibly by extensive usage of phosphorus-containing fertilizers and pesticides.

Key Words: Trace elements, Enrichment factor, Rain and snow, Wet deposition, Atmospheric pollution, Acid rain