

Historical metal contamination (Lead and Osmium) in the atmosphere of Montreal from 1973 to 2013: An approach coupling chemistry and isotopes

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In 1969, the city of Montréal established a network of sampling stations to monitor the air quality on the island. These stations collect aerosols (total suspended particles in our study; TSP) at various locations, representative of specific environments: downtown, harbor, road traffic... Here we present the variations of the TSP concentrations between 1973 and 2013. Results show several decreases in the TSP levels that usually follow the implementation of mitigation measures by the government. The analysis of the Pb atmospheric concentrations identify three distinct periods: 1) 1973, with high atmospheric Pb concentrations, 2) between 1973 and 1988. Pb concentrations decreased at a rate of $0.05 \mu\text{g}/\text{m}^3/\text{year}$, following the phasing out of lead in gasoline (from 1974 to 1990 in Canada) and 3) since 1993 with a somewhat slower decrease in atmospheric Pb. The addition of Pb stable isotopes allow to decipher the evolution of the corresponding sources of contamination during this whole period: While the combustion of leaded gasoline explains most of the first period, emissions with a signature hinting at US industries mainly contribute to the Pb atmospheric budget between 1988 and 2002. From then, atmospheric Pb is characterized by a mixture of sources that seems to reflect a higher contribution from minor local Pb emitters. On the other hand, osmium (Os) atmospheric concentrations remain low over the same period. Higher concentrations suggest a non-radiogenic anthropogenic Os contribution, possibly related to road-traffic-derived osmium (i.e. catalytic converters).