Sources and processes controlling the historical atmospheric pollution in Montreal from 1968 to present: an isotope view through the different carbonaceous aerosol fractions

YASSER MORERA-GÓMEZ[1,2] AND DAVID WIDORY[1]

[1] Geotop/Université du Québec à Montréal (UQAM), 201 Ave Président Kennedy, Montréal, QC, Canada
[2] Centro de Estudios Ambientales de Cienfuegos (CEAC), AP 5. Ciudad Nuclear, CP 59350 Cienfuegos, Cuba

Isotope geochemistry has now demonstrated its added value for both identifying sources and characterizing processes controlling the budget of most of the environmental contaminants. The main goal of this study is to characterize the aerosol contamination in Montreal since 1973 by isotopically studying the total, inorganic and water soluble organic carbon (WSOC) fractions from aerosols samples collected over a tens of monitoring stations disseminated on the island. To fulfill this objective we are proposing a methodology based on the following parameters: concentrations of the total, inorganic and WSOC fractions and their corresponding $\delta^{13}C$ and ^{14}C. Coupling all these chemical characteristics and isotope systematics inherently increases the possibility to discriminate the sources of aerosol contamination and to better constrain their respective contributions. WSOC concentrations and $\delta^{13}C_{WSOC}$ are determined in total suspended particles (TSP) by LC-IRMS (Thermo Scientific Delta V Advantage), a relatively novel technique that allows an online and rapid analysis, collected from several monitoring stations that represent various degrees and types of anthropic influence (background, traffic, industrial and downtown). We are also measuring the total C concentrations and their corresponding $\delta^{13}C$, as well as carbonates concentrations using an Elemental Analyzer (Vario MACRO Cube, Elementar, Hanau, Germany) coupled to an IRMS (IsoPrime 100, Cheadle, UK). The generated dataset will be coupled with i) local meteorological data to compute the conditional bivariate probability function to determine the most probable type and geographical location of the involved sources of contamination, and with ii) the HYSPLIT modeled backward-trajectories to estimate potential long-range contributions. Preliminary results will be presented and discussed during this presentation.

Combining chemical and isotope information from each of the aerosol carbon fraction will increase our understanding of their urban budget and ultimately help decision makers build better designed mitigation plans.