Cd, Zn & Hg isotope compositions of PM10 of main atmospheric sources of pollution in Paris: New tools for a precise discrimination

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Due to their relatively high concentration in urban environments (from 10 to more than 50 µg.m-3), atmospheric particles have potential damaging effects on the Public Health. Hence, the development of measures dealing with fine particulate matter is considered a priority by the EU Clean Air For Europe (CAFE) Programme. Still, the origin of these airborne particles is subject to debate, as classical chemical methods showed their limitations.

Recent studies have shown that stable isotopes of elements such as carbon, nitrogen or lead could be of great help in the search of new particle air pollution tracking tools. We will present here preliminary results on the pioneer use of stable isotope compositions of cadmium, zinc and mercury to help decipher the different possible origins of PM10 pollution in the atmosphere of Paris (France): waste incineration, road traffic, central heating and coal-fired power plants.

Results show that the use of cadmium ($d^{114}Cd$) and zinc ($d^{66}Zn$), and the combination of both provides a reliable and precise tool for discriminating the different families of particle vectors. The isotope systematic of mercury ($d^{200}Hg$) is more difficult to apprehend due to the low levels encountered (mercury is mainly present under gaseous form, but is still observed at low concentrations in particles), but does show significant variations between the different sources.

Air samples were taken on three different sites covering different scenarios: i) background pollution in Paris, ii) under the plume of a major pollution source and iii) Paris vicinity.

Corresponding chemical and isotope analyses should help identify the main vectors for the three elements (Cd, Zn & Hg) considered and also help assess their respective contributions to the levels of pollution observed.