

SOURCE APPORTIONMENT OF AIR POLLUTION IN AN URBAN AREA INFLUENCED BY LOCAL INDUSTRIES IN CALI, COLOMBIA

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Background and aim: Cali is the third largest city of Colombia, and is located in the southwest of the country. The northern city limits with Yumbo, a town with a large industrial area that includes smelting factories and battery recycling and production. Previous measurements did by environmental authorities showed air concentration levels above standards limits for PM_{2.5} and lead. As part of a study designed to assess the impact of this industrial area in air quality and health of scholars in northern Cali, we estimated source apportionment to PM_{2.5} using Positive Matrix Factorization (PMF).

Methods: We collected 90 air samples for PM_{2.5} on Teflon filters and analyzed them for 57 elements by X-ray Fluorescence (XRF), organic carbon (OC) and elemental carbon (EC) by Thermogravimetry, and ions by Ion chromatography. After selection of species by number of samples over detection limits, duplicates species, signal to noise ratio, PMF were modeled with 24 species, including lead, which we used as Yumbo industrial activities tracer as Colombia have green gasoline (lead-free).

Results: The largest component of pm_{2.5} was the carbonaceous fraction, accounting for 53-83% total mass. 3 factors profiles were identified and their contribution estimated. The principal factor was industrial emissions (53.7% contribution), identified by presence of Pb (91.4%) in its profile, and others heavy metal like Ni (47.62%) and Cd (63.82%). Second factor was mobile sources and associated dust (27.7% contribution), identified by the large presence of OC (72.59%), EC (86.83%) and V (51.71%) for mobile; and Fe (25.68%), Ti (36.22%), Ca (48.43%) and Si (38.91%) for associated dust. Third factor was from industrial sources (18.6% contribution) unrelated to lead generating activities, and was identified by presence of Zn (91.49%) and Fe (44.67%).

Conclusions: Industrial activities in the municipality of Yumbo have an impact on air quality in the northern area of Cali and this should lead to joint actions for pollution control.