Seasonal variation in trace elemental concentrations in PM$_{2.5}$ particles in Nairobi, Kenya

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A better knowledge of the chemical and physical constituents of local aerosol particles is essential to assess their impact on the environment, the human health as well as identifying pollution sources. The air quality in many major cities of Africa is declining since regulations and control policies remains inadequate due to insufficient knowledge of pollutant levels and their sources. Previous measurement campaigns in Nairobi were on short time basis (for example van Vliet & Kinney 2007, Gatari and Boman 2003, Gatari et al. 2005) but the current campaign started early 2008 and will continue until the end of 2009

Aerosol samples were collected at an urban background site in Nairobi, Kenya, during a measurement campaign for the whole year 2008. A cyclone was used to collect fine aerosol particles (PM$_{2.5}$) over a period of 48 h per sample. PM$_{2.5}$ refers to particles with an equivalent aerodynamic diameter < 2.5 μm. The particles were collected on polycarbonate filters and were analyzed for particulate mass, black carbon (BC) and several trace elements ranging from Si to Pb.

The sampled integrated particle mass was determined gravimetrically with a Mettler Toledo TM5 microbalance. A photometer and an Energy Dispersive X-Ray Fluorescence (EDXRF) spectrometer were used to analyze BC and trace elements, respectively. The EDXRF spectrometer uses a Siemens diffraction x-ray tube and Mo secondary target. The target is a 1 mm thick Mo plate of 99.99 % purity. The fluoresced secondary x-rays propagate through two Ag collimators giving near monochromatic Mo characteristic x-rays for sample excitation. The spectrometer is laboratory built in an optimized three axial geometry that gives good signal to noise ratios for the analyzed elements.

Nairobi is the capital city of Kenya with a population estimated to more than 3 million inhabitants. The city's growth has been rapid through influx of citizens from rural Kenya. It is located just south of the equator at 1700 m above sea level. This high altitude gives Nairobi a moderate climate. There are two dry seasons that together with the "long rain" and "short rain" seasons characterizes the climate in Nairobi and its surroundings.

The local weather information was obtained from the Department of Meteorology, Government of Kenya, Nairobi. Evaluation of particulate mass and analyzed trace element concentrations with respect to local weather parameters and back trajectory calculations will elucidate seasonal variations.

The influence of natural and anthropogenic sources on air quality in Nairobi as a large African city will be discussed. The results will be compared to other large cities with air quality problems as well as to national air quality standards and WHO guideline limits.

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