

## Abstract

There have been very few studies in Kenya on aerosols despite the global demand on aerosol ground studies in the perspective of climate and the human well being. Therefore, atmospheric aerosol studies became the bases of the work covered in this thesis which describes aerosol studies in Kenya and development of an energy dispersive X-ray fluorescence spectrometer (EDXRF).

Atmospheric aerosol is composed of both the particulate and gas phases and they contain chemical compounds and elements that are harmful to human health. Their particle size range is related to sources and it determines their impact in the ambient atmosphere. Anthropogenic activities mainly contribute fine particle mass ( $PM_{2.5}$ ) and natural processes contribute both fine and coarse ( $PM_{(10-2.5)}$ ) particle masses.  $PM_{10}$  ( $PM_{2.5} + PM_{(10-2.5)}$ ) are inhalable into the human respiratory system and the fine particles have a marked impact on climate.  $PM_{10}$  particles are efficient in transporting micronutrients between ecosystems, soiling and destroying buildings. Any policies meant to protect the environment by controlling atmospheric aerosol particles will need back up knowledge on particle sources and their physical and chemical characteristics.

The five sampling campaigns covered under this study were conducted in Nairobi city, Meru and Nanyuki towns and on the slopes of Mount Kenya at about 2000 and 4000 m above sea level. The multi-elemental analyzing capacity of EDXRF and statistical treatment of data are indispensable tools in aerosol source identification. These techniques were used in all the published results. The results revealed the dominancy of local and regional biomass burning and local soil dust emissions. Traffic emissions were more pronounced in urban centers, with higher concentrations of Br, Pb and Mn in Nairobi, but with minor contribution at the remote sites on Mount Kenya. Marine influence was seen superimposed in the soil dust emissions and agricultural activities were also identified through elevated concentrations of Ca, Cl, K and S in the same source. Nairobi turned out to be a more polluted city in comparison to Dar es Salaam, Haborone and Khartoum in Africa. The developed EDXRF spectrometer will play a major role in environmental studies in Kenya. Long term measurements of Kenyan aerosols are recommended to better understand the total picture of aerosol particles including seasonal variation.

**Key words:** Mount Kenya, Nairobi, atmospheric aerosols, EDXRF, biomass burning, climate, human health. Middle troposphere.