

Doctoral Thesis
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**Kgakgamatso Moloi: *Properties of air pollutants in Botswana-
Sources, concentration and dispersion of aerosol particles***

Abstract

This thesis reports results obtained by the author in studies of ambient atmospheric aerosol particles in Botswana over a period of three years. Throughout the text considerable attention is devoted to characteristic properties of aerosol particles including sources, concentration and dispersion.

By use of a combination of aerosol sampling with dichotomous impactor and X-ray fluorescence analysis of filters levels of a number of anthropogenically and naturally derived element concentrations in air have been determined. When simultaneous information on gaseous components, for example SO₂, climatological data and other properties of the aerosol are measured, the total data will contain information on particle sources and transport. Important properties of the aerosol, like black carbon content and bio-availability of components in the aerosol have been studied in laboratory experiments. A technique for sequential leaching of aerosol samples based on analysis by Energy Dispersive X-Ray Fluorescence was developed. This technique has pointed to the fact that anthropogenically derived aerosol in Botswana consists of a large fraction, which is mobile in the environment (bio-available), while the naturally derived aerosol consist mostly of the silicate (immobile) fraction

The author carried out field campaigns, which covered five strategically chosen locations of Botswana. It has been possible to identify vehicles and mineral smelting industries as contributing to the aerosol of Botswana by use of principal component analysis. By use of air mass backward trajectories episodic cases (increased levels of pollutants) can generally be related to air masses arriving from regions around Pretoria and Johannesburg in South Africa. Conclusions regarding long distance transport can also be drawn from levels of characteristic components in the aerosol, for example the ratio between sulphur dioxide and particulate sulphur concentrations, or from raised levels of typical emitted metals from distant industrial activities.

Key words: Air pollution; X-ray fluorescence; Fine particles; Biomass burning; Black carbon.