Geophysical Research Abstracts, Vol. 7, 05603, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05603

Chemical composition and sources of tropospheric aerosols from northern Zimbabwe

D. Nyanganyura (1,3), W. Maenhaut (4), A. Makarau (1,2), M.M. Mathuthu (1), F.X. Meixner (1,3)

(1) Department of Physics, University of Zimbabwe, Harare, Zimbabwe, (2) Department of Meteorological Services, Harare, Zimbabwe, (3) Max Planck Institute for Chemistry, Biogeochemistry Department, Mainz, Germany, (4) Institute of Nuclear Science, Gent, Belgium Zimbabwe (nganyura@mpch-mainz.mpg.de / Fax: ++49 6131 305 542)

Aerosol data collected in fine (<2 μm EAD) and coarse (2-10 μm EAD) fraction sizes at Rukomechi Research Station (16.136˚S and 29.40˚E) in northern Zimbabwe from August 1994 to December 1999 was studied to identify (a) basic seasonal patterns, (b) inter- and intra annual variations, and (c) long-term temporal trends of elemental concentrations of 24 elements, black carbon and particulate mass. The elemental aerosol loadings at the site exhibit remarkable seasonal features for both the fine and coarse size fractions. On the basis of these temporal trend of aerosol concentrations, an annual cycle of two seasonal periods (dry and wet) was established. Principal Component Analysis (PCA) revealed that aerosol loadings at Rukomechi arise from mineral dust sources, biomass burning, sea sprays and anthropogenic activities. With the exception of the sea salt elements, all the sources types tend to have strong seasonality features for both the course and fine modes. Dry season is the period of high aerosol loading caused by frequent dust out breaks, biomass burning activities and anthropogenic factors. The major wet season sources of aerosols are mineral dust, biomass burning, anthropogenic components. Long term monthly variations show that the source types are activity in different times of the year with the sea salts elements portraying a bimodal distribution. The origins of some elements like sulphur originate from a variety of sources that depend of the fraction size and the season. The long term trends show (a) an increase in the biomass burning and anthropogenic activities, (b) a decrease in the mineral dust sources, and (c) now significant changes in the sea salts elements. The source apportionment revealed that the main contributor to the total particle mass is

biomass burning followed by mineral dust sources for both the fine and coarse mode. The knowledge of the strengths and temporal variability of the aerosol sources, as well as the properties of the measured aerosol, is of importance for the southern African region where aerosol particles play crucial role in cloud and precipitation development, as well as in climate forcing.