

Aerosol Optical Depth Measurements at the Nairobi Ozone Sounding Observatory using a Ground-Based MICROTOPS-II Sunphotometer

W.O. Ayoma¹, G. Levrat², and B. Calpini²

¹Kenya Meteorological Department, P.O. Box 30259; Nairobi, Kenya; Fax: +254-20-576955;
E-mail: wayoma@yahoo.com

²MeteoSwiss, Aerological Station Payerne, CH-1530 Payerne, Switzerland

Atmospheric aerosol particles, both natural and anthropogenic, are important in Earth's radiative balance. The aerosols affect the Earth's radiation budget through interaction with solar and terrestrial radiation; they are also known to be an important ultraviolet (UV) forcing factor. Aerosol optical depth (AOD) measurements at the Nairobi Ozone Sounding Observatory (1° 18'S, 36° 45'E, 1795 m above sea level) started in 2003. Measurements are conducted using handheld sunphotometers, MICROTOPS II (Solar Light Inc., Glenside, Pennsylvania) (Figure 1). The sunphotometers measure AOD at 380 nm and 500 nm.

The monthly variations of aerosol optical depths taken during a cloud-free morning or afternoon indicated seasonal variations with relatively high AOD or atmospheric turbidity in the dry-season (July-August) and very low AOD during the rainy season (March, April, and May). The seasonal variability of the AOD in the region is mainly related to the seasonal characteristics of the production, transport, and removal processes of aerosols. The high AOD during the dry season coincides with the period of intense biomass-burning caused by tropical Savanna fires, cultivation practices, and burning agricultural residues. The values of AOD measurements in the dry season show larger day-to-day variation.

Five-day back trajectories from three selected altitudes (2.5 km, 5 km, 9.5 km) above Nairobi for the dry season (DJF) indicated a dominance of northerly flow that penetrates as far as Nairobi; the northerly flow provides a pathway for Saharan dust and biomass burning smoke to reach Nairobi resulting in high AOD.



Figure 1. Aerosol optical depth measurements using a sunphotometer in Nairobi, Kenya.