3.031 Seasonal pattern of aerosol optical depth over Southern West Africa.

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Abstract:

This study investigates the seasonal pattern of aerosol optical depth (AOD) in Southern West Africa (SWA). From December 2015 to April 2017, a network of a new type of lightweight handheld sun photometer has been deployed at 4 sites located in Côte d'Ivoire and Bénin. Observations were acquired at two sites located at the seashore in Abidjan and Cotonou and 200 km northward inland at Lamto and Savè. AOD were measured daily at 465, 540 and 619 nm by local operators. The AOD follows a marked seasonal cycle with maxima observed during the winter dry period (December-March) when the Harmattan wind brings southward mineral dust and biomass burning aerosols. AOD can reach a maximum of 3.5 during mineral dust outbreaks in Cotonou, and 1.8 in Abidjan, which is located farther from the main dust sources. The analysis of the aerosol Angstrom exponent shows that mineral dust represents 35% of the observations with a mean AOD of 1.0 +/- 0.4. Biomass burning events are 15% of the observations with a mean AOD of 0.7 +/- 0.2. During the dry season, the AOD is well correlated (R=0.7) to the particulate matter (PM) surface concentration, highlighting the low altitude transport of aerosol in the Harmattan layer. The comparison between the sun photometer observations and the MODIS-derived AOD shows an excellent agreement for both urban and rural sites and is used to infer surface PM concentrations in SWA over the last decade.