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Trends and Variability analysis of vertical aerosol distribution and properties using CIMEL micro-lidar and sun-photometer measurements

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The extreme complexity, diversity and variability of atmospheric particles involved both in air quality and climate forcing require observations of aerosols and clouds in their natural medium. Passive ground-based remote sensing measurements such as those performed by sun-photometer networks like AERONET although highly relevant for the total column cannot be used to derive information on aerosols vertical distribution. However, active systems like Lidar provide the aerosols as well as the thin clouds vertical profiles. Since 2005, LOA started developing the basis of small Lidar network composed of single wavelength (532 nm) elastic backscatter CIMEL micro-LIDAR (http://www-loa.univ-lille1.fr/Instruments/lidar/).

The current core surface network is composed of a couple of routinely operated lidar (24h per day/7days a week) located in Lille (France), M'Bour (Dakar, Senegal), a third one located in La Guadeloupe being under-development. Thanks to LOA and IRD efforts, Lidar database grows since that time and has recently been analyzed to assess vertical distribution of aerosol particles and their variability in time. Combination with sun-photometer data fortunately acquired at the same time enable retrieval of more accurate aerosol vertical profiles (aerosol extinction profile, σext(z), as well as an average aerosol extinction-to-backscatter ratio, Sa). Assessment of data quality, monitoring of instrument performances, improvements and validation of automatic inversion method have been performed. The next step, the analysis of time series of aerosols retrieved parameters, in relation to atmospheric dynamics has now started and first results will be presented. We will present more specifically results obtained from 2005 to present time over Dakar, a city located at the West African coast and all year long affected by the export of mineral dust as it moves westward to the north Atlantic ocean. Beside the fix lidar/sun-photmeter station, LOA has developed a mobile platform combining micro-lidar and sun-photometer that was operated during DRAGON campaign in the USA, Summer 2011 and will be presented too.