A study of Saharan dust and biomass burning by using Raman LiDAR and sun-photometer measurements in SHADOW2 campaign

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The SHADOW2 (SaHAran Dust Over West Africa) campaign is aimed to study the physical and chemical properties of the Saharan dust, as well as biomass burning in dry seasons. The site is chosen near the coast of the Atlantic Ocean, at IRD M'Bour Center, Senegal. The second phase of SHADOW2 was performed in December 2015 and January 2016. During this period, the Saharan dust transported from north and biomass burning from south or southeast have been frequently observed.

Multiple instruments from CaPPA laboratory are involved into this campaign, such as the wind Doppler LiDAR, the multi-wavelength Raman LiDAR, sun-photometer, Aethalometer, aerosol particle counter, airborne sun-photometer and so on.

The multi-wavelength Raman LiDAR, LILAS, (LIlle LiDAR AtmosphereS) operated by LOA (Laboratoire d'Optique Atmosphérique) is an important instrument and provides 3β+2α+2δ (β, backscattering coefficient; α, extinction coefficient; δ, particle depolarization ratio). This is the first time that we are able to provide polarization measurements of two channels. Except for the extinction, backscattering coefficients and depolarization ratio (V. Freudenthaler, 2009), the LiDAR measurements also permit the acquisition of Angstrom exponent, LiDAR ratio and water vapour mixing ratio. This information helps provide a comprehensive understanding for the atmosphere.

Some cases are selected from the two-month measurements to be analysed and interpreted. For example, on 20, January 2016, a layer of biomass burning and dust mixture was observed at an altitude of 3500 m (Q.Hu, 2016).

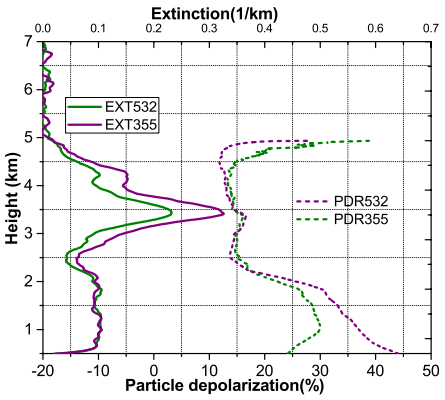

Fig 1. Extinction and depolarization from Raman retrieval for 355 nm and 532 nm channels.

The measurements of both LiDAR system and ground-based sun-photometer are put into retrieval by GRASP/GARRLiC (Generalized Aerosol Retrieval from Radiometer and LiDAR Combined data) (A. Lopatin, 2013). From GRASP/GARRLiC, the size distribution, complex refractive indices are derived and show good coincidence with AERONET products. The vertical profile of aerosol concentration also coincides with Raman retrievals (I. Veselovskii, 2016). Fig 2 is an example of extinction retrieved from GRASP/GARRLiC.

Data analysis and retrievals are still in process, and error estimation will also be available in the coming few months.

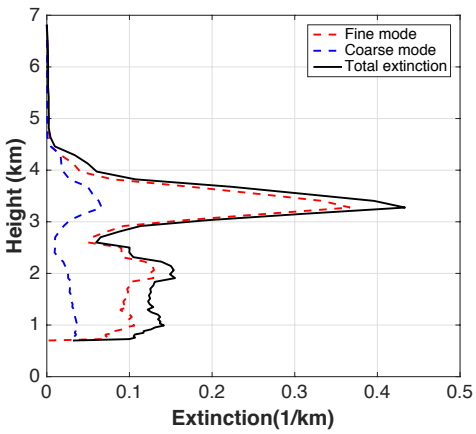

Fig 2. Retrieved extinction profile from GARRLiC for 532 channel. (20, January 2016)

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