Investigate the single scattering albedo of dust aerosols and their impact on climate in Northwest China

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Abstract

Arid and semi-arid areas comprise about 30% of the earth surface. Changes in climate and climate variability will likely have a significant impact on these regions. Gobi and desert region over Northwest China is one of major dust aerosol sources in East Asia. To improve our understanding of the impact of dust aerosol on climate, an intensive field experiment has been conducted by Semi-Arid Climate & Environment Observatory of Lanzhou University (SACOL) in Dunhuang (40.49°N/94.95°E, 1061m ASL) over Northwestern China from April 1th to June 30th, 2012. There are two sites deployed in Dunhuang: SACOL's mobile facility (SMF) is set up nearby the farmland (located in the Gobi Desert), and a set of spectra and broadband radiometers are installed at the top of a three-floor building (about 10 meter above the ground and 1 km away from the SMF). A suite of active and passive ground-based remote sensing instruments are deployed in the field campaign, such as Micro-Pulse Lidar (MPL), Cimel sun photometer (CE318), Prede sky radiometer (POM-01), grating spectroradiometer (MS-700) and Multi-Filter Rotating Shadowband Radiometer (MFRSR). We can retrieve aerosol optical depth, Ångström exponent, volume size distribution, single scattering albedo, and asymmetry factor from these ground-based

measurements. Furthermore, aerosol optical properties can be inter-compared and validated for each other. Surface radiation quantities estimated from SBDART radiative transfer model can be compared with a dozen of the state-of-the-art ground-based radiometers' observations. The dust aerosol radiative forcing and heating rate in Gobi desert over Northwest China are estimated using the Fu-Liou radiative transfer model. This campaign is vital to understand the characteristics and variations of dust aerosols in East Asian so that we can evaluate more accurately the effect of mineral dust aerosols on global and regional climate change in the future.

Keywords: Dust aerosols, aerosol optical properties, regional climate effect, field campaign

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