Variation in aerosol optical properties over the foothills of the central Himalayas

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Atmospheric aerosol possesses havoc impacts on climate system and ecological environments, human health and agricultural productivity. The Himalayas and Tibetan Plateau are still one of the most pristine regions in the world. But the environment over these regions are continuously degraded due to the transport of pollution from the foothills of the Himalayas; mostly the Indo-Gangetic Plains (IGP) region. Thus, analysis of aerosol optical properties over two sites; Lumbini and Kathmandu (using AERONET's sun photometer) from the southern slope of central Himalayas were conducted in this study. During 2013-2014, average AOD was found to be 0.64±0.41 (Lumbini) and 0.45±0.30 (Kathmandu) whereas average angstrom exponent (AE) was found to be: 1.25±0.24 and 1.26±0.18 respectively for two sites. The relation between AOD and AE indicated the Mixed aerosols and those of urban/industrial and biomass burning origin constituted the major aerosol types in Lumbini and Kathmandu. A clear bi-modal distribution of aerosol volume size was observed with highest volume concentration during post-monsoon season in fine mode and pre-monsoon season in coarse mode (Lumbini) and highest value over both modes during pre-monsoon season in Kathmandu. The single scattering albedo (SSA) analysis suggested that the aerosols over the Himalayan foothills sites are dominated by urban-industrial and biomass burning aerosols. Asymmetry parameter (AP) and refractive index (RI) analyses also confirmed that aerosols over these two sites were mostly anthropogenic aerosols (from urban and industrial; and biomass burning). Long-term studies are essential to understand and characterize the nature of aerosol over this research gap zone.

Keywords: aerosol optical depth, angstrom exponent, urban, biomass burning, Central Himalayas