

Observations of aerosol optical properties by sky radiometers at SKYNET Southeast and South Asian sites

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Direct and scattered sunlight measurements using sky radiometers were performed at two SKYNET sites –Phimai (15.18°N, 102.56°E) in Thailand and New Delhi (28.63°N, 77.17°E) in India. Phimai is a rural site and during the dry season (January to April), the site is affected by biomass burning. New Delhi is an urban site and expected to be influenced by vehicular and industrial emissions and agricultural waste burning. Depending on the data availability, aerosol optical properties during the year 2012 and 2016 were analyzed for New Delhi and Phimai, respectively. During the dry season in 2016 at Phimai, enhanced aerosol absorption optical depth (AAOD) was observed corresponding to the influence of biomass burning. The wavelength dependence of AAOD was quantified using the absorption Ångström exponent (AAE). The mean AAE at Phimai during the dry season in 2016 was 1.5 ± 0.2 , indicating the presence of organic brown carbon aerosols. This was consistent with coincident multi-axis differential absorption spectroscopy measurements showing higher concentration of organic compounds (formaldehyde and glyoxal) during the dry season, corresponding to biomass burning. At New Delhi, the mean AAE values during winter (December ~ February) and monsoon season (June ~ August) were 1.51 ± 0.23 and 0.88 ± 0.24 , respectively. The higher AAE during winter indicates the significant injection of organic brown carbon, probably due to transportation of carbonaceous materials from agricultural waste burning from Northern India. Thus, deduction of AAE, retrieved through sky radiometers observations, is expected to be useful for better understanding the physical and optical properties of light absorbing organic aerosols.