Evaluation of GCOM-C aerosol products using ground-based sky radiometer observations

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Aerosol optical thickness (AOT) at 380 and 670 nm retrieved from the Global Change Observation Mission-Climate (GCOM-C) observations from January to September 2019 was evaluated using the ground-based SKYNET sky radiometer measurements at Chiba (35.62˚ N, 140.10˚ E), Japan and Phimai (15.18˚ N, 102.56˚ E), central Thailand. Chiba and Phimai are urban and rural sites, respectively. AOT retrieved from the sky radiometer observations from were compared with the coincident multi-axis differential optical absorption spectroscopy (MAX-DOAS) AOT values. Under clear sky conditions, both the datasets show excellent agreement. The sky radiometer and GCOM-C AOT values show a good positive correlation (*R*) ~ 0.90 at 380 nm in both sites. At 670 nm, the *R*-values were 0.67 and 0.87 for Chiba and Phimai, respectively. Despite the low *R*-value at 670 nm over Chiba, the temporal variation of AOT was well reproduced by the satellite observations. Over both sites, the agreement between the datasets was mostly within ±0.2. Over Chiba, the higher differences in the AOT values were mostly related to cloud screening in the datasets. The mean bias error (MBE) (GCOM-C –Sky radiometer) for the Chiba site was ~ -0.08 and ~ -0.02 at 380 and 670 nm, respectively, for the coincidence criterion of 0.1˚ x 0.1˚. For the similar coincidence criterion, the MBE values were higher for the observations over the Phimai site. The potential reason was the influence of biomass burning in addition to the cloud influence. The spatial resolution of the satellite coincidence data had a significant impact on the MBE at 380 nm over the Chiba site. Overall, the retrieved AOT values of both datasets were generally consistent indicating the excellent potential of the GCOM-C observations of aerosol properties, especially in the ultra-violet region.

