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Retrieval of aerosol optical parameters using spectral irradiances measured at surface

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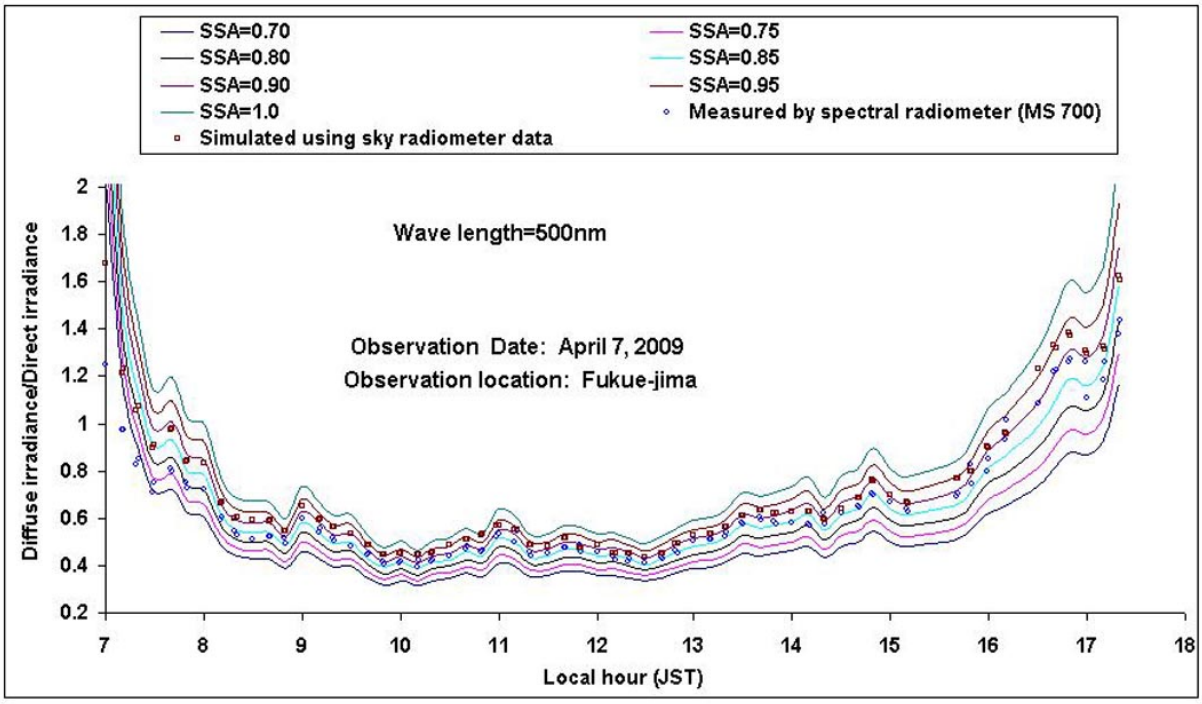

For the accurate evaluation of aerosol effects on atmospheric heat budget as well as climate change study, a number of space- and ground- based remote sensing approaches as well as numerical simulations have been utilized in the recent years. In order to validate the results of sophisticated research tools (e.g., numerical models and space-based remote sensing products) as well as to study aerosol effects in regional scales, data obtained from ground-based remote sensing have become very important. This highlights the necessity and importance of ground-based remote sensing approaches. Therefore, production of qualitative data from ground-based remote sensing approaches is vital to improve our understanding regarding aerosol effects in climate change

As a part of understating aerosol, cloud, and radiation interaction in the East Asia region, SKYNET network has been collecting data at various locations of the East Asia. Among several instruments, sky radiometer (Manufactured by PREDE Co., Ltd.) has been continuously measuring data related to aerosols and cloud. With the purpose of quantifying the accuracies of aerosol optical parameters retrieved from sky radiometer data as well as to retrieve aerosol optical parameters at wavelengths beyond sky radiometer measurement range, a new spectral radiometer (MS 700), which is capable to measure global and diffuse spectral irradiances, has been deployed at some key SKYNET sites. This study is dedicated to (i) develop an algorithm to retrieve aerosol optical parameters using spectral irradiances measured at the surface, (ii) to validate the results of

sky radiometer, and (iii) to provide accurate and detailed aerosol optical parameters for air craft observation periods over Fukuejima during March and April, 2009.
The retrieval algorithm for MS 700 includes a method of correcting cosine response correction factors for direct, diffuse, and global spectral irradiances, retrievals of key aerosol optical parameters such as, spectral aerosol optical thickness, spectral single scattering albedo etc. The instrument of each site has been calibrated with standard grating sun photometer (GER 2600), which was calibrated at Mauna Loa, to derive new calibration constants. In the presentation, we would like to discuss the geometry of an instrument, measurement technique, and retrieval algorithm. In addition, we would also present some preliminary results as well as comparison of results with results obtained from sky radiometer data. As an example, the above-mentioned figure shows diffuse and direct irradiance ratio at the wave length of 500nm measured by spectral radiometer (MS 700) (open circle), simulated values using sky radiometer optical parameters (open square), and simulated values at different single scattering albedos raging from 0.7 to 1.0 with optical thickness and asymmetry parameter of sky radiometer data (solid lines). The above mentioned result is for observation day of April 7, 2009 at Fukue-jima. The measured direct diffuse ratios by MS 700 show consistencies with calculated values using optical parameters of sky radiometer.

Keywords: Aerosol optical thickness, Single scattering albedo, Atmospheric heat budget