



Regional distribution of PM_{2.5} over a megacity Osaka in Japan derived from satellite, AERONET and/or LIDAR measurements

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Monitoring of particulate matter near the surface is very important for the Earth environment, especially for human health and atmospheric environment. In Japan, concentration of suspended particulate matter (SPM), which is similar to PM₁₀ but sharply cutting at 10 μm for the particle diameter, has been monitored since 1975 and is still now widely available for a daily monitoring. New PM_{2.5} rule was defined in 1997 in the United States, however the standard rule for PM_{2.5} monitoring has not yet been made in Japan until 2009. As a result, the number of PM_{2.5} instruments is very limited in Japan. In practice the PM_{2.5} samplers are only used for scientific objects. Therefore estimation of PM_{2.5} over the wide area as possible as in Japan is an urgent issue.

Anthropogenic small particles dominate the air especially over the urban areas because of local emissions by diesel vehicles and industries. The distribution of these particles is complicated due to the increasing emissions of sulfuric, nitric, carbonaceous and other aerosols in association with economic growth in East Asia. The goal of this work is to estimate PM_{2.5} distribution over the second big city Osaka in Japan based on satellite measurements. A brief processing line of PM_{2.5} estimation is as follows:

1. Acquisition of surface reflectance based on satellite data to retrieve aerosol characteristics.
2. Retrieval of columnar aerosol optical thickness (AOT) over Osaka from the fine resolved satellite image.
3. Vertical profile of aerosol concentration with NIES-LIDAR measurements.
4. Surface level aerosol optical depth (AOD) derived from columnar AOT and LIDAR dataset.
5. Estimation of PM_{2.5} based on the relationship between AOT, surface AOD, LIDAR and in-situ PM_{2.5} dataset simultaneously accumulated at AERONET/Osaka site since 2008.

Note that, collocated data set of in situ PM_{2.5}, AERONET AOT, and NIES-LIDAR data are available at Kinki University's AERONET site as mentioned in the above item 5. It is of interest to mention that a number of AERONET instruments are planned to be set within the Osaka of Japan during the international field campaign DRAGON in spring of 2012. Naturally these new gridded AOT data set will be useful not only for the present our work but also for further validation of satellite results and so on.