

An Improvement of Aerosol Retrieval Algorithm over Urbanized Regions using MODIS Level 1B data at the Local Scale

Ahmad Mubin Wahab¹, Md. Latifur Rahman Sarker^{1,2,*}

¹ Department of Geoinformation, Universiti Teknologi Malaysia, Malaysia

² Department of Geography and Environmental Studies, University of Rajshahi, Bangladesh.

The retrieval of aerosol optical depth (AOD) over urbanized regions using satellite observation still very challenging and complicated because of the high reflectance from bright surfaces areas. Urbanized region is densely populated and a major contributor to the emission of atmospheric aerosol by anthropogenic activity which can produce high concentrations of aerosol and cause harm to human health. In this study, 10 years (2002 – 2012) MODIS data was used to estimate AOD over the Hong Kong region. Aerosol reflectance of MODIS 500m was determined by separating top of the atmosphere (TOA) reflectance from surface reflectance and the Rayleigh path reflectance. However, surface reflectance was taken directly from MODIS land surface reflectance product (MOD09GA) because of the recent improvement atmospheric correction using 6S vector algorithm.

From aerosol reflectance of MODIS 500m, AOD for each pixel was retrieved from Look-up tables (LUTs) which was constructed using Santa Barbara DISORT Radiative Transfer (SBDART) code for specific range of geometry and using four different types of local aerosol model parameters. A spectral shape fitting algorithm was used to select an optimum local aerosol model by considering the minimum residual between MODIS aerosol reflectance and aerosol reflectance from radiative transfer code, and interpolation of AOD for every pixel was carried out using a least square estimation technique. Finally, AOD at 0.55 μm wavelengths for each pixel was extrapolated based on the relationships between wavelength and angstrom exponent. Validation of MODIS retrieval AOD was carried out by comparing the high quality AOD data from AERONET measurement for few years. Result indicates that with this processing algorithm AOD can be estimated at the local scale using the high resolution MODIS data, and the obtained accuracy (ca. 85%-90%) is very much reasonable and comparable with the accuracy obtained from other studies (ca. 76%-90%).

Keywords : AOD; MODIS; LUT; SBDART; local aerosol model

*Corresponding author. Tel.: +60 075530959/01115158825.

Email address : sarker@utm.my.