Estimation of Ground-level PM2.5 Concentrations in Northern Thailand from MODIS Aerosol Product

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Abstract: The air pollution levels in many cities in Thailand are much higher than WHO air quality guideline levels in recent year. Especially the high values of PM2.5 concentrations which observed from ground-based instruments, impact on human health has been widely reported. The study of the relationship between PM2.5 concentrations and satellite-derived aerosol optical depth (AOD) in conjunction with meteorological data, other geographic factors, i.e. land use/land cover, terrain elevation, is necessary for supporting government policy decision making.

Geographically Weighted Regression (GWR) model can account for the spatial variability in the relationship of geographic factors. In this study, the GWR model is used to fit the AOD product values obtained from the Moderate Resolution Imaging Spectroradiometer (MODIS) from February to April 2019 and meteorological data, land use/land cover, and terrain elevation to the ground-observed PM2.5 concentrations. The spatial variability, which derived from GWR model, can be used to explain the influence of each factor to the PM2.5 concentrations in different geolocations. The results of GWR model show that the coefficient of determination (R^2) of PM2.5 ranges from 0.40 to 0.60. The performance of this GWR model compared to multiple linear regression (MLR) and linear mixing-effect (LME) model is also proposed. The GWR model performs better than other models.

Keywords: PM2.5, Geographically Weighted Regression, GWR, Air pollution, MODIS, Aerosol optical depth AOD.