World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:13, No:07, 2019

High-Resolution Spatiotemporal Retrievals of Aerosol Optical Depth from Geostationary Satellite Using Sara Algorithm

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Abstract : Aerosols, suspended particles in the atmosphere, play an important role in the earth energy budget, climate change, degradation of atmospheric visibility, urban air quality, and human health. To fully understand aerosol effects, retrieval of aerosol optical properties such as aerosol optical depth (AOD) at high spatiotemporal resolution is required. Therefore, in the present study, hourly AOD observations at 500 m resolution were retrieved from the geostationary ocean color imager (GOCI) using the simplified aerosol retrieval algorithm (SARA) over the urban area of Beijing for the year 2016. The SARA requires top-of-the-atmosphere (TOA) reflectance, solar and sensor geometry information and surface reflectance observations to retrieve an accurate AOD. For validation of the GOCI retrieved AOD, AOD measurements were obtained from the aerosol robotic network (AERONET) version 3 level 2.0 (cloud-screened and quality assured) data. The errors and uncertainties were reported using the root mean square error (RMSE), relative percent mean error (RPME), and the expected error (EE = ± (0.05 + 0.15AOD). Results showed that the high spatiotemporal GOCI AOD observations were well correlated with the AERONET AOD measurements with a correlation coefficient (R) of 0.92, RMSE of 0.07, and RPME of 5%, and 90% of the observations were within the EE. The results suggested that the SARA is robust and has the ability to retrieve high-resolution spatiotemporal AOD observations over the urban area using the geostationary satellite.

Keywords : AEORNET, AOD, SARA, GOCI, Beijing
Conference Title : ICRSG 2019 : International Conference on Remote Sensing and Geoinformation
Conference Location : Dublin, Ireland
Conference Dates : July 29-30, 2019

Open Science Index, Civil and Environmental Engineering Vol:13, No:07, 2019 publications.waset.org/abstracts/101729.pdf