Retrieval of aerosol optical depth from global measurements of Directional Polarimetric Camera using an adaptive algorithm

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The Directional Polarimetric Camera (DPC) [1] is China's first space borne polarized earth observation sensor onboard the Gaofen-5 satellite. It obtains the global multi-spectral, multi-angular and polarized radiation during every 2-days revisiting period, with the spatial resolution of 3.3 km. We applied the adaptive land-atmospheric decoupling (ALAD) algorithm [2] to the 3×3 pixels aggregated DPC measurements. The ALAD algorithm can adaptively decouple the land surface, the molecular and the aerosol reflected solar radiation and achieve aerosol optical depth (AOD) after four sub-procedures. First, estimate the initial surface polarized reflectance using Nadal–Bréon model (1999); second, retrieve the pending aerosol optical parameters using a lookup table method at the visible band and convert it into near-infrared band; third, correct the DPC measured polarization radiance at top of atmosphere by the former aerosol parameters and convert the near-infrared surface polarized reflectance into visible band, thus the surface polarized reflectance were reobtained for aerosol retrieval in next iteration; at last, judge the retrieved results to ensure the authenticity and accuracy of the inversion results. We compare the DPC obtained AOD with the dark target retrieved AOD from Moderate resolution Imaging Spectroradiometer (MODIS) measurements. They have good consistency in spatial distribution, no matter the region or the global distribution. The correlation coefficient between the DPC and MODIS AOD is higher than 0.75.

References

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[2] Wang, H., X. Sun, L. Yang, M. Zhao, P. Lui, and W. Du, 2018: Aerosol retrieval algorithm based on adaptive land–atmospheric decoupling for polarized remote sensing over land surfaces. *J. Quant. Spectrosc. Radiat. Transf.* **219**, 74–84.

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