

Retrieval of marine aerosol optical depth based on multi-angle intensity and polarization measurements from the DPC onboard the GF-5B satellite

Xiaobing Sun^{a,*}, Yichen Wei^{a,b}, and Rufang Ti^a

^aAnhui Institute of Optics and Fine Mechanics, Hefei Institutes of Physical Science (HFIPS), Chinese Academy of Sciences, 350 Shushanhu Rd., 230031 Hefei, P.R.China

^bUniversity of Science and Technology of China, 96 Jinzhai Rd., Hefei 230026, China

*Presenting author (xbsun@aiofm.ac.cn)

The polarization characteristics of atmospheric scattering radiation enable polarization detection technology to be effectively applied in the study of planetary atmospheric properties. In recent years, researchers have utilized polarimetric remote sensing data to conduct studies on atmospheric characteristics, achieving satisfactory results. The Directional Polarimetric Camera (DPC) onboard China's GaoFen-5B satellite (GF-5B) was launched in September 2021. The DPC is a multi-angle polarimetric observation payload. It is capable of the quantitative retrieval of aerosol optical property parameters [1]. It is important that the marine aerosol inversion research is conducted using the DPC/GF-5B multi-angle polarization detection data [2].

In this talk, based on the DPC payload, the study proposes a marine aerosol retrieval algorithm utilizing multi-angle intensity and polarization measurements. Referencing the retrieval framework of POLDER's POLAC (Multi-directionality and POLarization-based Atmospheric Correction) algorithm [3, 4], the forward simulation process considers the sea surface wind speed parameter to characterize the effects of a rough sea surface. Concurrently, auxiliary data is incorporated to achieve pixel-by-pixel dynamic gas absorption correction. Following preprocessing steps such as cloud masking, sun glint identification, and gas absorption correction, the multi-angle polarimetric reflectances at the 490 nm, 670 nm, and 865 nm bands are combined with the multi-angle reflectance at the 865 nm band. These are iteratively optimized to derive aerosol optical depth (AOD) and fine-mode fraction (FMF) over the open ocean. AERONET data and MODIS products are utilized for validation and comparative analysis. The results indicate that the retrieved DPC AOD is highly consistent with AERONET measurements (correlation coefficient of 0.86) and shares identical spatial distribution trends with concurrent MODIS products, achieving a high cross-validation correlation coefficient of 0.94. The polarization inversion study of marine aerosol characteristic parameters is beneficial for atmospheric correction and marine color remote sensing.

References

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