Joint retrieval of aerosol optical properties and water leaving reflectance over coastal waters based on multi-angle polarimetric observations

Meng Gao[a,*] Peng-Wang Zhai[a], Bryan Franz[b], Yongxiang Hu[c], Kirk Knobelspiesse[b], Paul Jeremy Werdell[b], Amir Ibrahim[b], and Feng Xu[c]

[a]*JCET, Physics Department, University of Maryland, Baltimore County, Baltimore, MD 21250, USA*
[b]*NASA Goddard Space Flight Center, Code 616, Greenbelt, Maryland 20771, USA*
[c]*MS 475 NASA Langley Research Center, Hampton, VA 23681-2199, USA*
[d]*Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109, USA*

**Presenting author (mgao@umbc.edu)*

Ocean color remote sensing is an important tool to monitor water quality and biogeochemical conditions of ocean. Atmospheric correction, which obtains water leaving radiance from the total radiance measured from satellite-borne or airborne sensors, remains a challenging task over coastal waters due to the complex optical properties of aerosols and waters. The suspended sediment particles as well as the colored dissolved organic matter (CDOM) in coastal waters usually vary independently over wide range in time and space, and may share similar absorption spectrum with the absorbing aerosols in deep blue and UV. The strong backscattering over turbid waters may also contribute to non-zero water leaving signals in near infrared bands.

In this talk we report an atmospheric correction algorithm over coastal waters through the joint retrieval of aerosol optical properties and water leaving reflectance using polarized radiance measurements at multiple viewing angles and multiple wavelengths. We implement the vector radiative transfer model for a coupled atmosphere and ocean system as the forward model and generalize the bio-optical model to account for the absorption and scattering of phytoplankton, CDOM and non-algal particles (NAP). The ocean bio-optical model parameters and the aerosol refractive indices and size distributions are retrieved using the Levenberg–Marquardt optimization algorithm, and then used to calculate the atmospheric path radiance. The atmospheric correction is conducted by subtracting the atmospheric path radiance from the total radiance measured at the top of atmosphere. The retrieval algorithm is validated by synthetic Research Scanning Polarimeter (RSP) measurements. The algorithm will improve the current atmospheric correction algorithm by enabling the retrieval of ocean color under optically-complex atmospheric and oceanic conditions.

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