Joint retrieval of aerosol properties and water leaving radiance using multi-angular polarimetric measurements over open and coastal ocean waters

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Ocean color remote sensing is a challenging task over coastal waters due to the complex optical properties of aerosols and hydrosols. In order to accurately estimate water leaving signals, we implemented a joint retrieval algorithm to obtain aerosol properties and water leaving signal simultaneously based on polarimetric measurements. The algorithm can be applied to both open and coastal waters. The open water optical properties in the algorithm are modeled by the chlorophyll-a concentration, while the coastal water optical properties are modeled by seven parameters which explicitly account for the absorption and scattering by phytoplankton, colored dissolved organic matter and non-algal particles. The aerosol and ocean optical properties are retrieved by the Levenberg–Marquardt optimization algorithm based on a coupled atmosphere and ocean radiative transfer model. The algorithm has been validated with synthetic data generated by a vector radiative transfer model [1]. We will discuss the retrieval procedure and accuracy using the airborne Research Scanning Polarimeter measurements from two field campaigns [2]. The goal is to assist the future development of the atmospheric correction algorithm using polarimetric measurements for the NASA's Plankton, Aerosol, Cloud, and ocean Ecosystem mission, which includes a hyperspectral Ocean Color Instrument and two multi-angle polarimeters onboard: the UMBC Hyper Angular Rainbow Polarimeter and the SRON Spectro-polarimeter for Planetary EXploration.

References

[1] Gao, M., P.-W. Zhai, B. Franz, Y. Hu, K. Knobelspiesse, P. J. Werdell, A. Ibrahim, F. Xu, and B. Cairns, 2018: Retrieval of aerosol properties and water-leaving reflectance from multi-angular polarimetric measurements over coastal waters. *Opt. Express* **26**, 8968–8989.
[2] Gao, M., P.-W. Zhai, B. Franz, Y. Hu, K. Knobelspiesse, P. J. Werdell, A. Ibrahim, B. Cairns, and A. Chase, 2019: Inversion of multi-angular polarimetric measurements over open and coastal ocean waters: a joint retrieval algorithm for aerosol and water leaving radiance properties. *Atmos. Meas. Tech.*, submitted.

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