

Interactive comment on “Joint retrieval of aerosol and water-leaving radiance from multi-spectral, multi-angular and polarimetric measurements over ocean” by F. Xu et al.

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We thank the reviewers for their professional comments and suggestions. Detailed responses to Anonymous Referee #2 are provided below:

(1) The introduction part need to summarize the current status of aerosol remote sensing over ocean with/without polarization

Reply: As a brief summary of aerosol retrieval algorithms in use by current-generation satellite imagers over ocean, we added two paragraphs (2nd and 3rd) in the introduction.

(2) A small introduction about the AirMSPI instrument will help reader to understand

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the sensitivity study and the retrieval results.

Reply: We gave a small introduction of AirMSPI in the first paragraph of Section 4 of the original paper.

(3) Section 2.1, 2.3, 2.4 and 2.7 can be shifted to appendix part, the authors should merge and re-organize the radiative transfer strategy and surface-atmospheric coupling sections. Section 2.6 can be merged into section 2.5 and some more details should be included in the sensitivity study part.

Reply: As suggested, Sections 2.1, 2.3, 2.4 and 2.7 are moved into Appendices A-C. And we re-organized the sections of radiative transfer strategy and surface-atmospheric coupling. Section 2.6 has been merged into section 2.5.

(4) Section 3.4 should be summarized at the beginning of this section, like a summary of all assumptions of this algorithm. And a comprehensive sensitivity study is necessary for all the important assumptions here.

Reply: As suggested, we moved Section 3.4 to the beginning of Section 3 (namely as the 3rd paragraph). Regarding the comprehensive sensitivity study on the decoupling of AOD and SSA, retrieval assumptions, and the benefits of using multi-angle viewing, multi-spectral and polarimetric observations, we are currently performing z-score evaluation, information content analysis, and more truth-in-truth-out retrieval tests. So the work is still in progress. It will be worth of another full-length paper. On the other hand, the main purpose of this paper is to formulate the methodology for joint aerosol and water-leaving radiance retrieval. It forms a basis for one of the sensitivity studies we are heading for.

(5) Section 3 should be re-organized as Section 2.

Reply: We give technical details on the retrieval algorithm design in section 3, which should be interesting to algorithm scientists. But we considered your opinion and added before Section 3.1 a reminder to the readers, "In the next three subsections, we will give

some details on the design of multi-patch retrieval algorithm. Readers not interested in it could skip over them.”

(6) The difference (not absolute values) between Extended adding-doubling and SOS is preferable in Fig. 2

Reply: The difference was shown in the original paper in the right two panels of Fig. 2. However, we have modified the graphical style to clearly differentiate these plots from the left two panels.

(7) P32, Line 13 - 17, P34 Line 13 – 19, this part illustrates the potential coupling effect between retrieved AOD and SSA, some more detailed analysis, like for instance, a sensitivity study for typical cases is necessary

Reply: Such a study would add to the length of the paper. We believe it deserves a separate paper. This work is in progress.

(8) P33, Line 4 – 15, all the analysis is for case of AOD larger than 0.3? Please note that the global mean (both land and ocean) AOD is about 0.25, AOD over ocean can be much lower.

Reply: Line 4-15 are to explain the influence of aerosol loading in retrieving single scattering albedo. Five aerosol loadings from 0.02 to 1.0 are studied, which does cover the typical global AOD loading mentioned by the reviewer.

(9) A RGB map from AirMSPI can be helpful to understand Fig. 12

Reply: Since the ocean site under study is close to uniform across the image (5 x 5 km², in the yellow frame of Fig. 12a), it is hard to identify the difference even when we use the AirMSPI RGB color map.

(10) Section 4.2, comparison between AirMSPI and other instruments like MISR, POLDER will be interesting.

Reply: AirMSPI is an airborne instrument while MISR and POLDER are satellite-borne.

The number of bands and viewing angles, spatial resolution, and capabilities of polarimetric measurements are different from each other. While we agree that such a comparison would be interesting, it is beyond the scope of the current paper.

The revised paper was in the supplement file.

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/amt-2015-394/amt-2015-394-AC2-supplement.pdf>

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2015-394, 2016.

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