Spectral correction factors for the removal of glint perturbations in above-water radiometry

Replies to the Comments from Anonymous Reviewer REV#2

General appraisal

This manuscript describes a simulated data set of the reflection coefficients for sunlight interacting with a wind-roughened water surface. Coefficients are provided both for reflection of diffuse skylight only and for the sum of diffuse sky light and direct sun light. These coefficients are to be used in the processing of above-water radiometry measurements that aim at deriving the remote-sensing reflectance. During these measurements, one radiometer points towards the surface and therefore receives both photons that have interacted with the water body (the water-leaving radiance) and photons that have not entered the water and have only been reflected at the surface. This latter contribution is the one to be corrected for.

Therefore, the simulated data here presented should be quite useful for anyone attempting to process such above-water radiometry. The dependences that are here considered for these coefficients (wind speed, atmospheric conditions) have been previously assessed but probably not as thoroughly as in this work.

Comment 1 Overall, the paper provides all relevant information about the simulations and describes the results in great details. The models that were used are appropriate and have been run over a large range of conditions.

Reply 1 *The acknowledgment is appreciated.*

Comment 2 The number of Figures might be reduced a bit (18 Figures is a lot). Or some multi-panel Figures could be reduced to a single panel, for instance the one showing the largest variability, and a comment made in the text, like, for instance “results are similar for other conditions etc…”. For instance, Fig. 14 could be one panel only with 5 curves, one for each wind speed, showing the data for the 10° sun zenith angle and something like “.. results for other sun zenith angles show a lower dependence on the optical thickness”. Anyway, this is just a suggestion.

Reply 2 *The view of the Reviewer is appreciated. Still, all the figures were considered relevant to support the objectives of the work.*

Action 2 *An attempt will be made to reduce the of number of figures.*

Comment 3 Although I understand this is a data paper, not a research paper, I think some comparison with existing values for r would be extremely useful. I suggest the Mobley 2015 data could be used for this (or maybe the authors have another draft in preparation where the impact of using these new coefficients is assessed?).

Reply 3 *A direct comparison between the present ρ_d data — the novel contribution of this paper — and Mobley's ρ values (Mobley, 1999, 2015) is not possible on a consistent basis, since ρ_d accounts for the sole diffuse sky-radiance while Mobley's values account for the total (direct and diffuse) sky-radiance.*

A comparison between FEM-MOX ρ_T values and Mobley's was already presented. Specifically: D'Alimonte et al. (2021) details a comparison of FEM-MOX and Mobley (1999) ρ_T data for the sole wavelength and atmospheric condition adopted by Mobley (i.e., λ = 550 nm and aerosol optical depth at 550 nm τ_a^550 = 0.26); while the JRC report by Bulgarelli et al. (2024) analyses the spectral and atmospheric variation of ρ_T with respect to the values computed under these same conditions. Additionally, Zibordi et al. 2025 shows an assessment of ρ-factors by Mobley (2015), Bulgarelli et al. (2024) and Harmel (2023) using above-water and in-water reference measurements.

Action 3 *The text will be revised to better highlight previous results on the comparison of ρ_T data with independent data (including those by Mobley (1999)).*

Comment 4 More fundamentally, I am not sure I understand the need to spend much time describing the simulations including the direct sun glint. My understanding of the processing of above-water radiometry is that data are first screened to eliminate all potential sun-glint "spots". This is generally achieved by keeping the lowest few percent of the data set, which normally ensures that the only remaining contribution is the one by diffuse skylight. Section 3.2 alludes to this. Maybe another way to reduce the number of Figures?

Reply 4. *AERONET-OC quality control does not screen sun-glint contamination by keeping the lowest percentiles of the L_T distribution, but it applies a threshold to the standard deviation of the L_T distribution to remove measurement sequences affected by significant environmental perturbations (Zibordi et al. 2024 and reference therein). More fundamentally, the manuscript discusses ρ-factors accounting for both diffuse and direct sky-radiance contributions because of their long-standing community-wide application (Sect. 3.2, 5). In this context, the aim of Sect. 3.1 is to characterize the physical mechanism behind sun-glint occurrence, explaining why AERONET-OC's quality-control relying thresholds applied to the standard deviation of measurement sequences are effective.*

Action 4. *This same concept will be added in the Introduction, too.*

Comment 5 The uncertainty analysis on the wind speed value (section 3.4) is relevant. I think it could be completed by a sensitivity analysis on the values of the 3 angles at play here (sun zenith, view and azimuth difference). Would be useful to know how much error can be tolerated on the latter, for instance (does not matter when measurements are taken from a fixed platform with a well-controlled geometry but does matter on a ship, for instance).

Reply 5. *This exercise goes well beyond the objectives of the work focusing on the viewing angle and relative azimuths recommended by existing protocols and applied within AERONET-OC. In particular, regardless of the deployment platform (fixed or ship-based), alternative larger relative azimuth angles (e.g., 135^o) would be impacted by structure perturbations, which would add unpredictable errors in derived data products (D'Alimonte et al. 2026).*

Comment 6 And, finally, a short section telling readers how to use the data in their processing could be relevant.

Reply 6. *A short section will be added to illustrate the data structure of the dataset.*

Few specific comments

- **Comment 7** The description of the two components here considered that is given on lines 33-36 is clear, whereas I find the one in the abstract is a bit confusing. Therefore, I suggest the abstract is slightly modified in line with what is better said in the introduction.

  Reply 7 *The comment from the Reviewer is appreciated.*

  Action 7 *The abstract will be modified.*

- **Comment 8** The use of the L_R notation in Eq. (1) is not the wisest, because of the possible confusion with the radiance due to Rayleigh scattering.

  Reply 8 *The comment from the Reviewer is appreciated.*

  Action 8 *Symbol L_R will be clearly defined in the text, and a Table of symbols will be added to the manuscript. This should prevent any confusion.*

- **Comment 9** The ρ_D that appears line 130 should be better "justified". Not sure I understand the logic. Or call it ρ_G (for glint); would be more explicit I guess.

  Reply 9 *Subscript "D" stands for "direct". The use of "G" for glint might create even further confusion because of the need to identify both sun-glint and sky-glint.*

  Action 9 *The Table of symbols to be added to the revised manuscript will help avoiding confusion.*

- **Comment 10** The fonts used for most Figures are really too small. All Figures should be revised to become way more legible. I also recommend that multi-panel Figures use letters to make easier the identification of the various panels.

  Reply and Action 10 *The font in the Figures will be increased and letters will be added to multi-panel figures to ease panel identification.*

- **Comment 11** Fig. 3, right panel: I suggest stopping the red curve (aerosols) when there are no longer any aerosols in the atmosphere (a zero single scattering albedo looks weird).

  Reply and Action 11. *In Fig. 3, the aerosol curve will be restricted to existing data.*

- **Comment 12** Fig. 6: I have a hard time understanding what the various panels are. This should be made much clearer ((c) to (h) are back for a sun zenith angle of 40° as in Fig. 5; is that right?)

  Reply 12: *Yes, the reading is correct.*

  Action 12 *The caption of Fig. 6 will be modified to better clarify the content of the various panels.*