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

Replies to the Comments from Anonymous Reviewer REV#3

Preliminary comment: I agree with the two previous reviews, which have already provided a good, constructive assessment.

Comment 1 I find the work by Bulgarelli and colleagues to be good and useful – it provides the underlying scientific and methodological context for a dataset (look-up table) of simulated sea surface reflectance factors, which are necessary for determining remote-sensing reflectance Rrs from above-water measurements – Rrs is the primary link between satellite remote sensing and biogeooptical properties of the water body. The factors are freely available and appear to be relatively easy to extract and apply. Therefore, I support the publication of this work.

Reply 1*. The acknowledgment is appreciated.*

Comment 2 However, unfortunately, the primary focus in designing the simulations for the ρ-data was placed on the reanalysis of AERONET-OC data. In my opinion, it would have been relatively straightforward to generate higher resolutions of the spectrum, the angular geometry and the wind speed (up to 15 m/s) through additional simulations. Could these higher resolutions be achieved without difficulty by interpolating, for example, the spectral ρ-factor for direct application to hyperspectral Rrs? There is a further dependence of ρ on aerosol types (maritime, mixed and continental), which can be roughly determined from in situ measurements. I view as critical the (presumably justified) dependence on the aerosol optical depth at 560 nm (tau560), an additional parameter that is usually not measured outside the AERONET network. These aspects significantly limit, or indeed prevent, the practical applicability of the ρ-factors to other networks such as WATERHYPERNET or typical in situ measurement campaigns. Furthermore, comparisons with other models and ρ-factors cannot be readily carried out, for example, to document any potential skylight-overcorrections. I see another problem in the restriction to just one azimuth angle (90°), which is certainly practical, but which rules out a great deal of flexibility in the field, particularly as best-practice protocols recommend using also a different angle – 135° – as the optimum for glint.

Reply 2 *The primary aim of the dataset is to make accessible and usable the ρ-factors currently applied for the AERONET-OC Version-4 processing. This is now better emphasized in the text.*
The extension to additional wavelengths and wind speed, although conceptually straightforward, would require a consistent computational effort, since it would involve extensive Monte Carlo simulations. Still, the spectral dependence of ρ-factors is quite minor (a figure will be added to illustrate such a dependence accounting for the existing dataset), while uncertainties would be quite large for wind speeds higher than 10 m s^{-1} *where whitecaps may add a significant contribution to sea surface reflectance.*
As highlighted by the Reviewer, the ρ-factors were computed for three different aerosol types representing typical atmospheric aerosol occurrences in coastal, inland and open ocean waters. For the measurement conditions determined by the application of AERONET-OC quality control, the ρ-factors dependence on the aerosol type is negligible.
Also, as already mentioned by the Reviewer, the reference aerosol optical depth was selected at 560 nm. If the aerosol type is known, it is possible to derive τ_a(560) from the measured value. If not known, any solution adopted with independent ρ-factors (such as those from Mobley 1999, or 2015) could be applied (i.e., neglecting any aerosol dependence or only applying those ρ-factors

expected to better represent site-specific measurements). Because of this, the current dataset does not exhibit limitations preventing its applicability.
Comparisons with ρ values by Mobley (1999) were detailed in D'Alimonte et al. (2021) and Bulgarelli et al. (2024), and more recently experimentally addressed in Zibordi et al. (2025).
As far as the azimuth angle Δϕ between the solar and measurement planes, it is highlighted that alternative larger values (e.g., Δϕ=135°) would be impacted by structure perturbations (e.g., from ships or fix platforms), which would add unpredictable errors in derived data products (D'Alimonte et al. 2026).
The newly computed ρ-factors can certainly be implemented in any above-water measurement performed with Δϕ=90°.

Comment 3 There are certainly models and initiatives that aim for simpler and broader applicability, but these are not mentioned here. These include the 3C model (Pitarch et al., 2020; Pitarch, 2026), which I consider to be very promising, and the 'community processor' HyperCP (e.g. Tilstone et al., 2025). I would suggest that you address the limitations and further developments regarding sea surface reflectance factors in the discussion.

Reply 3. *HyperCP is a code largely relying on the Mobley's 1999 (or 2015) basic above-water concept, still accounting for a large number of options resulting from community work. Newly computed ρ values will be included, too. The 3C model (Pitarch et al., 2020; Pitarch, 2026) was shown to deliver results consistent with Mobley (1999) under measurement conditions relevant for the validation of satellite data products (e.g., mild to moderate sea state and clear sky), while uncertainty estimate remains the actual constraint of such a model. Since ρ-factors are only used in 3C to start the convergence procedure, their discussion in the manuscript is not considered relevant.*

Action 3 *A mention to the community processor HyperCP (e.g., Tilstone et al., 2025) will be added.*

Technical comment:

Comment 4 The figures are generally not very readable, certainly not in a printed version, and this is also a problem in the digital version where you can zoom in. The text size should be larger, and the ESSD Guidelines and general guidelines should be followed.

Reply and Action 4 *The text in the Figures will be enlarged to increase readability, and the ESSD Guidelines and general guidelines will be followed.*