Review of the manuscript "Origins, evolutions, and future directions of Landsat science products for advancing global inland water and coastal ocean observations", by Page et al.

General comments

I am quite confused about this paper. According to the authors, "The purpose of this paper is to communicate with aquatic scientists, satellite oceanographers, and the broader Earth observation community on the origins, requirements, challenges, successes, and future objectives for operationalizing global AR data products for Landsat satellite missions." However, I thought ESSD published papers introducing new datasets. The Landsat Level 2 provisional Aquatic Reflectance (AR) product has been available since 2020. I leave this to editorial decision, but I am not sure whether this journal is the right place for such a paper, which looks more like a review.

Specific comments

On Landsat 8/9 validation with in situ Rrs, I will be clear here. The gold standard for such a task is AERONET-OC data. AERONET-OC is the most precise, carefully calibrated data at disposal, with precisely characterized uncertainties, with all instruments within the network following the same procedures, software and calibration laboratories. Instead, GLORIA is pure noise, as already showed in Wei et al. (2025; Fig. 2), and once more shown in Figure 5 of this paper. GLORIA cannot tell anything about the satellite data being compared to, because the uncertainties in the in situ data are, most importantly, unknown. It is merged numbers from a diversity of research groups, most of which do not quite follow best practices on above-water radiometry, so to speak. The authors shall trust me, as I know virtually everybody who contributed to GLORIA. Regarding this, the sentence "Until validation campaigns are conducted on a routine basis, the combined GLORIA and AERONET-OC datasets offer a substantial validation pathway toward operational readiness" shall be removed. In summary, I encourage the authors to remove the comparison with GLORIA or leave them as a demonstration of its unsuitability for satellite validation.

Although this may be a bit off-topic, it is of utmost importance that USGS works in the reprocessing of Landsat 5/7 for aquatic applications and, eventually, the release of a harmonized time series. That would accomplish the main mission of Landsat, which is the development of long-term series. I am aware of the difficulties due to the S/N, band configurations, etc., but any efforts to overcome any of these difficulties would be very impactful.

Line 36: what the authors call "mid-resolution" we actually call "high-resolution". Mid-resolution for us are sensors like MODIS or OLCI.

Line 60: "terrestrial land" sounds redundant.

Lines 90-91: "characterize" sounds vague. What is being done, precisely?

Line 153: is the f_b coefficient the "bidirectional reflectance correction"? I am not sure what is being discussed there, but the bidirectional reflectance correction is a complex process in the

aquatic environment, that involves a bio-optical model, IOP retrieval and some look-up-table indexing. See literature on the matter, especially recent articles, and clarify this concept.

Line 234: "difficulty of treating adjacency effects" Does it mean that l2gen treats the adjacency effect in some way? In this respect, please see a recent contribution by Castagna and Vanhellemont.

Line 277: "community-driven" is more like "community-made"

Lines 287-288: "allow the scientific community to characterize and validate Landsat AR algorithm outputs in near real time". I do not things so, because the AERONET-OC data is a reprocessed product, released some time after the actual measurement.

Section 4.2 "Validation methodology". I have to warn about the satellite vs. in situ data matchup time window. Same day is not close enough. That violates community agreed practices, see Concha et al. A few hours will be already too much, as the coasts are dynamic areas and often tidal.

Equation (5): "$nLw\_f/Q(\lambda)$" that is quite a cumbersome notation. Please choose a better one. By that way, it actually means that the normalized water leaving radiance was corrected for bidirectional effects using Morel's method. Here, there are two issues:

(1) Morel is a method conceptually developed for open oceanic waters. For coastal and inland waters, other methods should be used. See recent works.
(2) If AERONET-OC data is corrected for bidirectional effects and Landsat data is not, as I suspect, that is an inconsistency. Both datasets shall be corrected, and using the same method.

References

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