Ocean Sci. Discuss., 12, C371–C375, 2015
www.ocean-sci-discuss.net/12/C371/2015/

Ocean Science Discussions
Open Access

Interactive comment on "Estimation of upward radiances and reflectances at the surface of the sea from above-surface measurements" *by Ø. Kleiv et al.*

G. Zibordi (Referee)

giuseppe.zibordi@jrc.it

Received and published: 1 July 2015

The manuscript presents and discusses the application of a new above-water method for the determination of in-situ water leaving radiances (Lw) or equivalent quantity, to support the validation of satellite ocean color radiometry data.

The manuscript addresses the problem with a limited data set (22 series of measurements) performed in challenging illumination conditions. Results indicate that the methodology can lead to large uncertainties, which the authors still consider adequate for the validation of satellite ocean color radiometry data.

While considering of general interest the proposed method, I believe that the work is

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

limited in terms of supporting data and analysis (see the extensive comments below). Additionally, the manuscript conclusions are often based on personal feelings and not science/technical requirements. I cannot recommend the manuscript for publication in Ocean Science.

Main concerns 1. In situ data set. The data applied for the analysis were collected under challenging observation conditions (i.e., mostly cloudy sky). Validation activities for satellite ocean color radiometry data must rely on in situ data collected during clear sky conditions. Because of this some of the proposed parametrizations may not apply to the clear sky that necessarily characterizes operational validation measurements.

2. Proposed measurement method. The method relies on the nadir-viewing geometry that may be largely affected by sun-glint during clear sky conditions (i.e., the observation conditions relevant for the validation of satellite radiometry data). This cannot be simply ignored because sun-glint perturbations in above-water radiometry, which statistically depend on sensor and illumination-viewing geometries, may become the source of unpredictable uncertainties.

Relevant comments

a. Page 1053, line 17. When considering a nadir-viewing geometry for the above-water radiance sensor, the measurement problem is certainly simplified from the analytical point of view. But, as indicated in the concerns, it enormously increases the difficulties to produce accurate data due to sun-glint perturbations during ideal measurement conditions (i.e., clear sky).

b. Page 1053, line 20. The text is ambiguous. The manuscript aims at proposing a method applicable to nadir-view observations and indicates the need to later address the application of the method to a non-nadir viewing geometry. This should be made clearer to avoid that future developments are intended for any above-water method that makes use of non-nadir observations.

OSD
12, C371–C375, 2015

c. Page 1054, line 11. The meaning of “were checked at the start” referred to the performance of the radiometers, is too general.

d. Page 1054, line 23. The fixed depth measurements (i.e., 0.5, 1.0, 1.5, . . . m) are difficult to perform from a ship which is naturally rolling due to wave effects. This has an impact on the uncertainties of extrapolated subsurface values.

e. Page 1054, line 26. As already anticipated in the concerns, data collected under cloudy conditions may not be suitable for the development and assessment of a method expected to support investigations in clear sky conditions.

f. Page 1055, line 7. The averaging of measurements, when referred to the above-water downward irradiance, smooths the effects of ship roll and pitch. A well performing radiometer should not produce appreciable “electronic spikes”.

g. Page 1055, line 22. Above-water radiance measurements which were performed at different time during cloudy conditions, are likely to be affected by illumination conditions changing over time. This may have largely affected the accuracy (or even the reliability) of the water-leaving radiance ratios given in the manuscript for the nadir to 40 degrees viewing geometries.

h. Page 1055, line 24. It is not clear which is the “attempt” that did not lead to satisfactory results.

i. Page 1056, line 4. The diffuse attenuation coefficient is only constant when the extrapolation water layer exhibits homogenous optical properties.

j. Page 1056, line 21. The indication that deploying the in water radiometer behind the stern of the ship may lead to a reduction of the signal up to 20% is a too general statement. An inappropriate deployment of radiometers may lead to errors much larger than 20%.

k. Page 1057, line 6. “Personal feelings” should not have much space in a methodology paper. From the manuscript it is clear that there was an attempt to avoid ship shading

OSD
12, C371–C375, 2015

effects (not to determine their effects) by operating the in-water radiometers at some distance from the superstructure. This implicitly may mean that the authors also assume that the reflection effects of the superstructure are negligible. This is completely fine. But “assuming something negligible” and “thinking that something is negligible” are quite different statements.

l. Page 1057, line 22. The quantity “Br” does not appear declared.

m. Page 1059, line 8. Immersion factors for different series of TriOS radiometers characterized by different optical windows (i.e., different values of ng) were documented by Zibordi and Dareki (2006). Those factors provide some sensitivity to equation 9 (actually, not essential for the manuscript).

n. Page 1060, line 17. The quantity Rr has spectral dependence that varies with the illumination conditions mostly as a function of Eda. Because of this, the fit of data taken under very different illumination conditions may be affected by a large variance. This suggests that fits depending on specific illumination conditions (i.e., overcast and clear sky) may much better support the application of the proposed method.

o. Page 1061, line 10. Probably it would be better to state that the spectral shape of Rw in the near-infrared is invariant, and not simply “constant”.

p. Page 1062, line 19. The values indicated as uncertainties for Lw, only refer to the uncertainties in the determination of the sub-surface values through the extrapolation process still ignoring uncertainties in depth values. A comprehensive determination of Lw uncertainties would require much more inputs. Because of this, the estimated uncertainty for Lua is not at all supported by evidence.

q. Page 1063, line 22. The statement that 13% (maximum) uncertainty is still satisfactory for a first check of satellite products is just a very personal judgment that may mislead the scientific community. Uncertainties of in situ data applicable for validation purposes should reflect mission objectives/requirements and not personal believes.

OSD
12, C371–C375, 2015

r. Page 1064, line 3. The low rms determined at 351 and 754 nm for Rr are simply due to the fact that the values of Rr at 351 and at 754 nm are hinge points in the fitting procedure.

Interactive comment on Ocean Sci. Discuss., 12, 1051, 2015.