Ocean Sci. Discuss., 9, C573–C576, 2012
www.ocean-sci-discuss.net/9/C573/2012/

Ocean Science Discussions

Interactive comment on "In situ determination of the remote sensing reflectance: an inter-comparison" *by* G. Zibordi et al.

G. Zibordi et al.

giuseppe.zibordi@jrc.it

Received and published: 14 June 2012

The Reviewer provides a few comments s and suggestions which are hereafter individually addressed (see the REPLY following each COMMENT).

SUGGESTIONS/REVISIONS

COMMENT: My primary technical concern is with using wavelength-aggregated statistics in Fig. 2. As shown it looks like the data fit quite well with very high r2 values. However, if you take blue or red wavelengths, however, the fits do not look as good and sometimes even look like a random "bullseye." It might be important to show these separately and do the regression on each wavelength individually and determine the errors by waveband. This is also particularly true of the above-water TRIOSB and E data in

blue wavelengths which appear to still be glint contaminated. REPLY: There is agreement on the comment. Spectrally-averaged data have been considered as a way to summarize results from the several instruments. New tables have now been added to report the individual spectral inter-comparison results for the various methods/systems for the basic radiometric products (i.e., Lw, Ed and Rrs). However, in view of keeping consistency with the uncertainty tables and also increasing readability, spectral values are only presented for the representative center-wavelengths (i.e., 443, 555, 665 nm). It must be however noted that the relatively small range of Lw values due to the low variability of the seawater bio-optical properties during field measurements, is the major reason for the pronounced clustering of spectral data and the lowering of R2 values with respect to those computed with the spectrally combined data.

COMMENT: How was the SeaPRISM corrected for sun glint? REPLY: Only general elements are provided in the text because details were already presented in several papers fully documenting the methodology that relies on the combination of measurement geometry and filtering of outliers. Because of the explicit question, in addition to the reference already provided (i.e., Zibordi et al. 2009), another one (i.e., Zibordi 2012) is now added. This latter specifically focuses on the problem of sun-glint perturbations in SeaPRISM data.

COMMENT: . . . only one correction is attempted for skylight "turbid water near infrared." Is the water turbid? It doesn't really appear so from the spectra. Did the authors try several models, including Gould et al. (2001) approach? Fig. 4 shows lots of error in the blue for the TRIOS sensors with the values from TRIOS being higher in blue (indicating glint contamination). REPLY: The proposed "turbid water near-infrared" correction is applicable to both turbid and non-turbid waters, since the correction factor (i.e., epsilon) tends to zero as the near infrared Rrs tends to zero in equation (14). The ARC measurements do not refer to particularly "turbid water" in the sense that the near infrared (700-900nm) remote sensing reflectance is quite small. However, it is not negligible and simpler "residual" corrections setting the near infrared Rrs to zero or

OSD

9, C573–C576, 2012

applying no near-infrared correction would give a significant error particularly in the red spectral region. Indeed only one “turbid water near-infrared” correction is presented for sky-glint of TRIOS-B data although a slightly different sky-glint correction is presented for the TRIOS-E data and a quite different correction is applied to SeaPRISM data. It is however recalled that the scope of this paper is to compare the protocols that are used operationally by these investigators, e.g. for the validation of MERIS, and not to test a variety of protocols. In view of the reviewer’s mention to the Gould et al (2001) approach, this has been investigated using TRIOS-B data. The Gould approach (G2001) is conceptually quite similar to that of Ruddick (R2005). The two are identical if four conditions are met: i. the same wavelength pair is used (715/735nm for G2001, 780/870 for R2005); ii. the same values are used for pure water absorption coefficient (taken from Pope and Fry (1997) in G2001, and deduced from reflectance measurements in R2005); iii. the same Fresnel coefficient is taken in the first step of each method (0.0.21 for G2001, wind speed dependent for R2005); iv. the same sky-glint radiance is determined (spectrally flat over 715-735nm for G2001, but estimated from the sky radiance measurements for R2005). Application to TRIOS-B ARC data of G2001 (with its original wavelengths and coefficients) instead of R2005, has given average differences of less than 1% over the 412-665nm spectral range. In view of this minimal difference it is considered to be not worthwhile lengthening the text and changing the scope of the paper to include these extra results. However, in view of the similarity of the two approaches, of which Gould et al (2001) is prior, the following sentence has been added to the text after equation (14): “It is noted that this scheme is similar to that proposed by Gould et al. (2001), although relying on different wavelengths and values of ïĄą and of the sea surface reflectance”.

COMMENT: Only Rrs spectra from the WISPER system are shown. If you showed the spectra from above-water TRIOS in comparison, it would show blue enhancement more pronounced than the Fig. 2 values indicating sky glint contamination. It would also make your analysis stronger to show the spectra from all of the approaches for comparison rather than the aggregated values. REPLY: The visual comparison of

OSD

9, C573–C576, 2012

spectra from the different systems/methods is quite qualitative because spectral percent differences are relatively small and additionally because the number of samples from the different systems/methods is different. The use of tables presenting spectral inter-comparison results (now included for Lw, Ed and Rrs as a result of a former comment) is expected to satisfy this request too.

COMMENT: Regarding the buoy data. Leathers et al. (2001) have down a nice self-shading correction based on the geometry of the Satlantic buoys. You might want to make sure your values coincide with their more thorough analysis. REPLY: The table of self-shading errors computed by Leathers et al. (2001) for a TSRB system using a 3-D scheme has been used to perform a comparison with the 2-D corrections applied to TACCS Lu data. Summary conclusions are now added into the presentation of the self-shading method applied for the TACCS systems.

Interactive comment on Ocean Sci. Discuss., 9, 787, 2012.