Ocean Sci. Discuss., 10, C911–C919, 2014
www.ocean-sci-discuss.net/10/C911/2014/

Ocean Science
Discussions
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Interactive comment on "Evaluation of MERIS products from Baltic Sea coastal waters rich in CDOM" *by* J. M. Beltrán-Abaunza et al.

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Received and published: 20 February 2014

Short comment. Peters, S.

General comment 1

I agree with the comments by reviewer Zibordi, especially comments 5 and 7 (considering ICOL).

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Reply to comment 1

The comments by the reviewer Zibordi, comments 5 and 7 have now been fully taken into account in the revision. Please refer to those comments to complement this reply.

General comment 2

The writing style may need some checking here and there. Some examples: "The use of MERIS full resolution Level 1b 3rd reprocessing data in coastal waters rich in CDOM, with additional corrections for smile, equalization of coherent noise and correction of the adjacency effect using ICOL, has shown to improve the accuracy of the MERIS reflectance and derived water products, when compared to sea-truthing data." Is it means that the 3rd reprocessing is improving compared to the 2nd reprocessing? (This was, (if I remember correctly) not the finding of the MERIS validation team)

Reply to general comment 2

A new effort has been done in order to reduce long sentences in the text, to improve the writing style as suggested by the reviewer. The statement raised by the reviewer does not mean that the 3rd reprocessing does improve data quality compared to the 2nd reprocessing. This study only shows the comparison of the 3rd reprocessing with in situ data and refers to previous studies in the region of interest to support that claim. However, we encourage the reviewer to read the reply to the comment 8 from referee 1 (Zibordy, G.) if interested in the comparison among different reprocessing versions of MERIS datasets.

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General comment 3

"Lower in situ chlorophyll concentrations (mainly $<$2.5 mgm-3, Fig.4) seem to have an influence on the accuracy" What is meant by this?

Reply to comment 3

The line referred by the reviewer is in page 2177 line index 16. It means that at low chlorophyll concentrations, random errors dominate in the retrievals. See Page 2158 line index 15. The text has been changed in the revision to explicitly mention the meaning of the phrase.

General comment 4

"The viable macro pixel retrieval ratio" I think this term is too complex.

Reply to general comment 4

The term is used on page 2172 line index 19 and 21. The term will be changed in the revision as requested by the reviewer. The term will refer textually in the revision to the increase on the number of viable macro pixels retrieved after ICOL processing compared with no-ICOL datasets.

General comment 5

In a recent publication as e.g. by Attila (2013) ICOL was discarded based on contradictory literature evidence. Also in grey literature such as

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(http://upcommons.upc.edu/pfc/bitstream/2099.1/7013/2/LaTeX1.pdf) some evidence does not suggest that ICOL is really improving retrievals in all parts of the Baltic Sea and some evidence does (e.g. http://www.peer.eu/fileadmin/user_upload/opportunities/metier/course6/c6_water_quality_water_processors.pdf). Of course the difficulty of past publications is that while comparing different processors, one has to take into account that over the years different versions of each module have been published including the processing to L1A which makes it quite difficult to compare results over time and between publications. Therefore I would like to suggest to weaken the suggestion to use ICOL for all Baltic waters or to firmly underpin the conclusion with data.

Reply comment 5

In the publication by Attila et al (2013) referred by the reviewer, the author does not use ICOL for processing neither make any claim why it was not used. In any case, by looking at the submission date of Attila which was received by the journal on the 10th of May 2010, if any ICOL was applied to the data but not included in the paper, the version of the ICOL processor should have been 1.0.x. The first prototype of ICOL. The ICOL+ version used in our study was 2.9.1. In this version the algorithm has already been extended for application over land and over case 2 waters, and clouds and sea ice are considered.

The grey literature referred by the reviewer that suggest that ICOL was not really improving the retrievals does not include the ICOL version used. However, it does refer to the BEAM version used which was 4.2. All processing done with BEAM versions previous to 4.7 had available only the ICOL version 1.0. Then after BEAM 4.7 ICOL version was 2.5 (see: http://www.brockmann-consult.de/beam-wiki/display/BEAM/Plug-ins). Therefore, the use of an ICOL version over Case-2 waters was not implemented yet in the master thesis of Arroyo-Pedrero (2009, the grey literature being referred), and thus the poor performance of ICOL in his results.

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The authors agree that not including the version number of each module in the literature published makes it difficult to compare results, that is why in this study the version of all modules are clearly referred.

The authors would not like to weaken the suggestion to use ICOL+ over Baltic Sea waters, as current papers in other areas also confirm our findings see for example, Vaičiūtė et al. 2012. Furthermore, Jenni Attila (work in progress, personal communication 2014) is currently using FUB and ICOL+ to use of MERIS data for monitoring coastal Water Framework Directive (WFD) water bodies.

Comment 6. Page 2170

How was it tested that the ICOL processor had worked as expected? "Statistics were gathered that the MERIS reflectance retrieval had improved for each processor" Where could I find these results?

Reply to comment 6

As mention on the reply to reviewer Zibordi-comment 5, This study had an expectation that ICOL may work on our study area as results of the findings of Kratzer and Vinterhav (2010) where the proposed assessment of ICOL has been taken fully into account.

The current study also did a similar assessment as performed in Kratzer and Vinterhav (2010) to check ICOL. Furthermore, this study also included the sum of absolute differences against in situ data (Eq. 2) and the percentage of change between ICOL and no ICOL (Eq. 3). The results were not included in the paper as our main objective was not to validate ICOL. The results can be made available per request or if the editor agrees could be added as complementary data to the paper.

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Comment 7. Page 2172 line 16

Use of ICOL increases the number of viable macro pixels for MEGS and FUB. Could you explain the mechanism that caused this?

Reply to comment 7

The mechanism is that the radiometric products derived after ICOL processing reduces the reflectance for previous overestimations and also reduces underestimations especially in the blue-green region of the spectrum. The result is a reduced flagging by each processor by correcting for atmospheric adjacency effects (in this case atmospheric scattering or stray-light from land) prior to atmospheric correction performed by each processor.

Comment 8

In the discussion, errors due to the fact that ICOL may introduce additional uncertainties are not discussed. Could you add this?

Reply to comment 8

As the main focus of the study is not ICOL processing, the authors would like to leave out more material to support ICOL processing. Complementary data can be available per request to the reader.

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Comment 9

I think the paper needs quite firm statements about the training range of the neural networks. They are referred to but for the discussion the info needs to be on the table. It would be interesting to see the comparison as visualized over the transects to see which processor is best capable to reproduce the spatial pattern.

Reply to comment 9

All the presented in situ data (match-ups) were within the training ranges of the processors. This has already been properly addressed in the methods and results and commented in the discussion. The authors do not feel the need to extend the discussion based on the the training range of the neural networks of each processor.

The main author of the paper is currently working on the spatial patterns observed over a longer time series in the region of study. Again, we would like to point out the addition of the image showing the ICOL effect as reply to reviewer Zibordi-comment 5. The authors not agree to add more images for visualization of the results. Nevertheless we agree that is interesting enough that it deserves a paper on its own.

Comment 10. Page 2176

FUB has a rather consistent off-set over the whole reflectance-spectrum (Table 6), and has therefore the most consistent spectral shape, i.e. the MNB do not change as drastically as for the other processors. Since this is based on averages per band instead of comparing spectra as a whole, this conclusion is a bit tricky.

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Reply to comment 10

Following the comment of the reviewer this statement will be changed to "FUB has a rather consistent off-set over the wavelengths of the reflectance-spectrum analysed" in the revision.

Comment 11. Page 2181

For future algorithms development in waters affected by high CDOM absorption it is therefore recommended to decouple the aCDOM retrieval from the retrieval of the CHL absorption at 443 nm (where high absorption of both aCDOM and CHL coincide), and instead, to use other spectral features of phytoplankton pigments in the longer wavelengths for chlorophyll retrieval, e.g. the chlorophyll peak in the red at about 665 nm. I'm afraid this will not work very well since the signal is low (little backscattering) and the absorption in this band is quite high.

Reply to comment 11

The authors believe that the recommendation of exploring the use of red and infrared bands to better discriminate chlorophyll in the Baltic Sea is worth of future research. Gilerson et al (2010)-"Algorithms for remote estimation of chlorophyll-a in coastal and inland waters using red and near infrared bands" has shown promising results of using MERIS bands (665, 708, 753 nm) with two/three-band algorithms having a very good match with field data and can be defined in only on terms of water absorption coefficients at the respective bands as well as the phytoplankton specific absorption coefficient at 665 nm. However, Moses et al (2009) have mentioned some challenges that need to be addressed first in order to be succeed in the implementation of fully operational algorithms that use the red-bands for chlorophyll estimation in case-2 waters.

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References

[Attila, J. et al.(2013)]: Attila, J., Koponen, S., Kallio, K., Lindfors, A., Kaitala, S. and Ylöstalo, P.: MERIS Case II water processor comparison on coastal sites of the northern Baltic Sea. Remote Sensing of Environment, 128, pp.138–149. 2013.

[Arroyo-Pedrero (2009)]: Arroyo-Pedrero, J.: Evaluation of MERIS Case-II Water Processors in the Baltic Sea. Master thesis. Helsinki University of Technology. Finland. 2009.

[Vaičiūtė et al.(2012)]: Vaičiūtė, D., Bresciani, M., and Bučas, M.: Validation of MERIS bio-optical products with in situ data in the turbid Lithuanian Baltic Sea coastal waters, J. Appl. Remote Sens., 6, 063568–1, 2012.

[Kratzer and Vinterhav (2010)]: Kratzer, S. and Vinterhav, C.: Improvement of MERIS level 2 products in Baltic Sea coastal areas by applying the Improved Contrast between Ocean and Land processor (ICOL)-data analysis and. Oceanologia. 2010.

[Gilerson, A. a et al.,(2010)]: Gilerson, A.A., Gitelson, A.A., Zhou, J., Gurlin, D., Moses, W., Ioannou, I., Ahmed, Samir,A.: Algorithms for remote estimation of chlorophyll-a in coastal and inland waters using red and near infrared bands. Optics express, 18(23), pp.24109–25. 2010.

[Moses et al (2009)]: Moses, W. J., Gitelson, a a, Berdnikov, S. and Povazhnyy, V.: Estimation of chlorophyll- a concentration in case II waters using MODIS and MERIS dataâĂŤsuccesses and challenges, Environ. Res. Lett., 4(4), 045005, 2009.

Interactive comment on Ocean Sci. Discuss., 10, 2157, 2013.