

“Technical Note: Algal Pigment Index 2 in the Atlantic off the Southwest Iberian Peninsula: standard and regional algorithms”

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Replies to Comments of Referee V. Suslin

Questions

Comments from Referees: page 3 line 30: you write “.. when η is below the threshold $\eta=1$ ”. Why $\eta < 1$ but more or less 1?

Authors’ response: The authors agree that this sentence was not easy to read, and have changed it accordingly. It should be: “...when $\eta \leq 1$ ”.

Authors’ changes in manuscript: In page 4, line 17, where it was “when η is below the threshold $\eta=1$ ”, it is now “...when $\eta \leq 1$ ”.

Comments from Referees: What the satellite data selection criteria you used in this study to analyze the quality of the Algal Pigment Index 2 in Sagres? It is clear that all was done 99 series * 3 (A, B, C) = 297 ground truth measurements, and the main factor is cloudy. What have any other criteria (except cloud) been used?

Authors’ response: The selection of satellite images was restricted to images without clouds and contamination, as indicated by not having specific Product Confidence (PCD) flags. The most common flags were PCD1_13 and PCD 19, where: PCD1_13 flag is a composite confidence flag for all the reflectance wavebands, and indicates a failure in the atmospheric correction for at least one of these wavebands and PCD 19 is a flag for uncertain aerosol type and optical thickness, i.e., also linked to the atmospheric correction. High levels of sun glint affected some of the days, and the corresponding flag was taken into account to check if the data were contaminated by a bright pattern of specular reflectance from the sun. An ice haze flag was also checked for some of the MERIS images when there was high radiance in the blue region of the spectrum caused by ice in the atmosphere or by a very high optical thickness. More details are in Cristina et al. 2014 and Cristina et al. 2016.

Authors’ changes in manuscript: The authors have now included a section in Page 3, Line 2 about the image selection criteria, quoting “The selection of satellite images was restricted to images without clouds and contamination, as indicated by not having specific Product Confidence (PCD), sun glint and ice flags. More details on the image selection criteria and full description of flags are reported in Cristina et al. 2016 (Cristina, S., Cordeiro, C., Lavender, S., Goela, P.G., Icely, J., Moore, G., Newton, A. Remote Sensing. 2016. Seasonal-Trend decomposition time series based on Loess

applied to MERIS products from the SW Iberian Peninsula: Sagres. Remote Sensing, 8(6), 449; doi:10.3390/rs8060449.)”

Comments from Referees: Page 12: Fig. 1(c,f): Are you sure that in these figures $N = 297$? I think $N = 54$. Check please!

Authors’ response: The authors thank the referee for noting this issue. In fact, there was an important detail requiring explanation in the manuscript. Regarding Fig.1, two different analyses are shown: a validation exercise (in left and middle panel) of MERIS products data against in situ reference data, and the other analysis (right panel) is the assessment of the performance of the regional NN algorithm for the retrieval of TChla. The different numbers of data points arise from the differences between the two analyses, the greater number of data points is used to evaluate the algorithm on the basis of its best performance (e.g. Cristina et al., 2016, Sá et al., 2015; Kajiyama et al., 2013). The x and y axes of the figures in the left and middle panels (Figs. 1a-d) represent the values of API2 product as retrieved by both MERIS and by the regional algorithm using MERIS reflectances, respectively. In these cases, the total numbers of points compared were 54. In contrast, Figs. 1c and 1f represent the regional algorithm trained using in situ reflectances collected from the in situ deployment of a Satlantic[®] radiometer. In this case, 4 to 8 reflectance casts were collected with the radiometer for each location corresponding to one in situ TChla measurement. As the objective was the regional algorithm performance assessment, all those points were used for this comparison, showing the best case scenario for the use of the regional algorithm. However, we can still show that comparison results remain consistent with the reported statistical values (Figure A1 in attachment) even when using only one radiometric cast per location (i.e., $N=54$ as in right panels of Fig. A1) to compare $MLP(R_{rs}^{SITU})$ with in situ references (TChla (ABS, HPLC)).

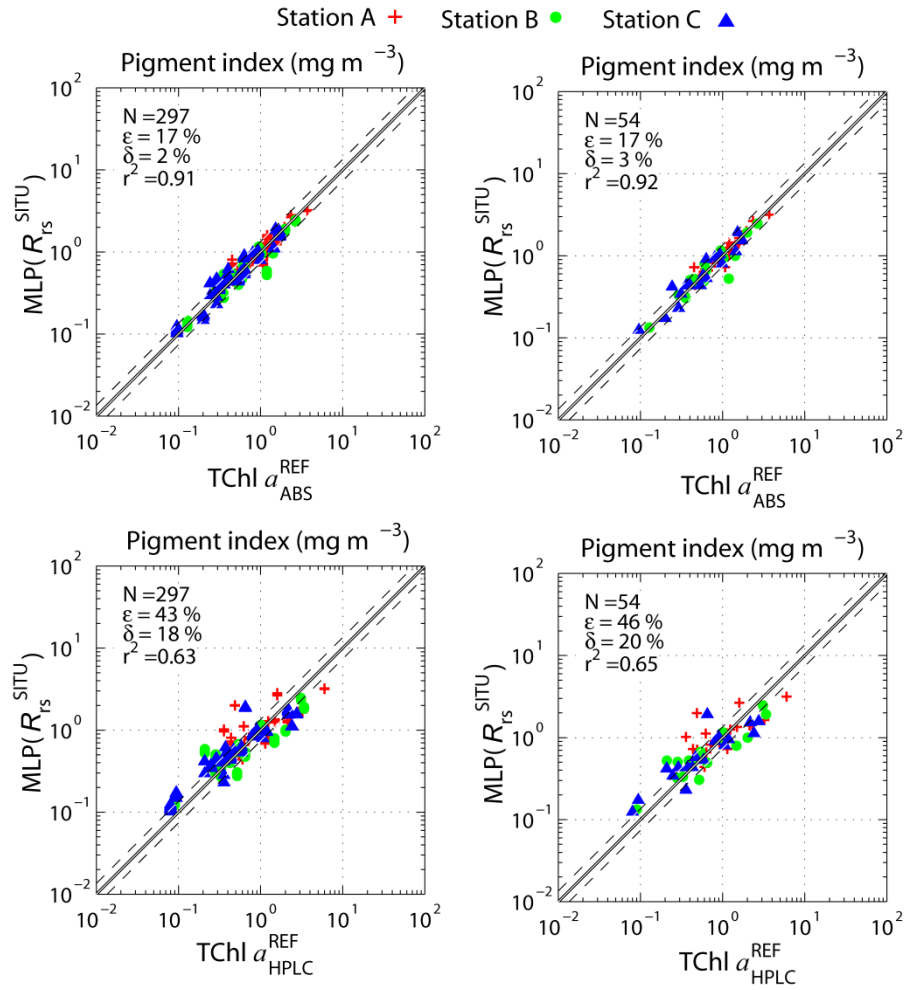


Figure A1 – Comparison of the performance of the regional NN algorithm results using only $N=54$ points (right panels), or with $N=297$ points (left panels, as originally Figs. 1c and 1f in the manuscript), both against TChl a references (retrieved through $a_{\text{ph}}(442)$ and with HPLC).

Authors' changes in manuscript: A more detailed explanation has now been included in the manuscript to explain better the difference between number of data points, in Page 5, line 2, quoting: “The total number of samples used to validate MER^{API2} and $\text{MLP}(R_{\text{rs}}^{\text{MER}})$ algorithms results with respect to the in situ reference measurements was $N=54$. In contrast, the total number of samples for assessing the performance of regional MLP algorithm with in situ reference measurements ($\text{MLP}(R_{\text{rs}}^{\text{SITU}})$), was $N=297$. This larger number of samples is based on the data from 4-8 radiometric casts for each in situ TChl a sample at each location.”

Comments from Referees: Page 13: In Fig. 2(b) I believe that you had the opportunity to show all measurements $N = 297$, not only $N = 54$!

Authors' response: The authors thank the referee for noting this issue. In fact, there were important details requiring explanation in the manuscript. In Fig. 2b the two techniques for retrieval of reference TChl a are compared. As explained by the authors in the previous comment, the number of in situ measurements for TChl a retrieval (either through absorption or by HPLC) at surface was only 54. The number of samples was

instead set to 297 in Figs 1c and 1f, because at each location sampled for TChla retrieval, 4 to 8 radiometric casts were collected. However the radiometric dataset is not represented in Fig. 2b, only in situ TChla measurements.

Authors' changes in manuscript: As mentioned in the previous comment, now the manuscript will include a more detailed explanation on the difference between the number of data points (Page 5, Line 2).

GENERAL COMMENTS

This research is actual. The regional bio-optical algorithms demand for more reliable results by using satellite ocean color data. This study is a continuation of the work of these authors (eg, IEEE GEOSCIENCE AND REMOTE SENSING LETTERS, Digital Object Identifier 10.1109 / LGRS.2016.2529182) for the development of a regional satellite algorithm in the Atlantic off the southwestern Iberian Peninsula.

Specific comments

Comments from Referees: in “Introduction” issue: To outline a significance of your research to add reference/ references to other regional algorithms (for example, for the Mediterranean Sea) GREGG , W.W. and CASEY , H.W., 2004, Global and regional evaluation of the SeaWiFS chlorophyll data set. Remote Sensing of Environment, 15 December, 93, Iss. 4, pp. 463–479, doi:10.1016/j.rse.2003.12.012.

Authors' response: The authors acknowledge the suggestion, and have now included this reference in the introduction section.

Authors' changes in manuscript: In page 2, Lines 12/13, the following sentence and references were added, quoting: “In such cases, regionalized bio-optical algorithms are required (Bricaud et al., 2002, Gregg and Casey, 2004).”

Comments from Referees: Statistics of in situ measurements by seasons is missed (among N=54/297 for stations A, B and C separately). In particular, it could be useful in connection with Fig. 2b.

Authors' response: The authors agree with the referee on the utility of the analysis of the seasonality. Notwithstanding, the scope of this brief technical note was to evaluate the performance of a regional algorithm for the retrieval of TChla and also on the product definition itself. The analysis of seasonal components and trends would also imply the consideration of forcing agents (e.g. upwelling), which could be considered as an interesting follow up work, but a bit far from the scope of the present technical note.

Comments from Referees: Warning: “Tchla (Ref, ABS)” cannot be equated with the concentration of chlorophylla in Sagres, we can only speak of in situ aph (442). Do you agree?

Authors' response: In this technical note, the authors are discussing pigment indices derived from different quantities, having taken into account the definition of algal pigment indices (API1 and API2) by the European Space Agency. API1 is equivalent to the concentration of TChla as determined by HPLC, and API2 is a proxy of TChla

concentration determined by means of an empirical relationship between $a_{ph}(442)$ and TChl a . In page 3, lines 27/28, it is explained that TChl a (Ref, ABS) is the in situ API2 equivalent measure estimated through $a_{ph}(442)$, using the following expression: $MER^{API2} = A \times a_{ph}(442)^B$, where $A=21.0$ and $B=1.04$ (derived from field measurements in the German Bight and Norwegian waters as in Doerffer and Schiller, 2007). To ensure that the comparisons were the most reliable possible, the choice of the in situ references was made based on these definitions.

Comments from Referees (Technical corrections): Page 3 line 2: “Total chlorophyll a (Tchl a) ..” repeat reference. The first reference to “Tchl a ” was on page 1 line 16 in Abstract.

Authors’ response: Thanks for noticing. The manuscript has been revised acknowledging the Referee’s recommendation.

Authors’ changes in manuscript: The Referee’s request has been addressed in the revised manuscript, where it was “... Total chlorophyll a (TChl a) ...” (page 3 line 2), it has been changed to “...TChl a ...” now in page 3 line 4.

Comments from Referees (Technical corrections): Page 3 line 8: instead “.. neural nets NN” stay “.. neural nets” or “.. NN”. The first reference to “NN” was on page 2 line 14.

Authors’ response: Thanks for noticing. The manuscript has been revised acknowledging the Referee’s recommendation.

Authors’ changes in manuscript: The Referee’s request has been addressed in page 3 in line 26 in the revised manuscript, where it was “... is estimated with two neural nets NN”, and has now been changed to “...is estimated with two NN”.

Comments from Referees (Technical corrections): Page 3 line 8: “BOA” The first reference to “BOA” was on page 2 line 6.

Authors’ response: Thanks for noticing. The manuscript has been revised acknowledging the Referee’s recommendation.

Authors’ changes in manuscript: The Referee’s request has been addressed in page 3 in line 26 in the revised manuscript, where it was “...bottom of the atmosphere (BOA)...”, and has been changed to “...computes BOA...”.

Comments from Referees (Technical corrections): Page 3 line 16: <http://ocportugal.org/sites/default/files/api2Sgr.pdf> - Page not found

Authors’ response: Thanks for noticing. The revised manuscript has the corrected link.

Authors' changes in manuscript: The correction of the link in the revised manuscript was made in page 4 line 4, instead ...”<http://ocportugal.org/sites/default/files/api2Sgr.pdf>”..., and now is going to be “...<http://ocportugal.org/sites/default/files/mlpSgrAPI2.pdf>”.

Comments from Referees (Technical corrections): Page 3 line 7: remove “:” in “2.2.1 MERIS Standard algorithm API2:”. The same for “2.2.1 Regional MLP NN algorithm:” on page 3 line 13

Authors' response: Thanks for noticing. The manuscript has been revised acknowledging the Reviewer's recommendation.

Authors' changes in manuscript: The “:” were removed from “2.2.1 MERIS Standard algorithm API2:” and “2.2.1 Regional MLP NN algorithm:”. These two sub-sections were changed in the revised manuscript to “2.2.1 MERIS Standard algorithm API2” in page 3 line 25 and “2.2.2 Regional MLP NN algorithm” in page 4 line 1.

Comments from Referees (Technical corrections): Page 4 line 1: “2.1 In situ reference data” move before issue “2.2.1 MERIS Standard algorithm API2”.

Authors' response: This section has been moved following the referee's suggestion.

Authors' changes in manuscript: The Section “2.1 In situ reference data” in page 4 line 1 has now been moved to page 3, line 8.

Comments from Referees (Technical corrections): “Page 12: In Figure 1(a), a caption of the X axis can be seen partially.”

Authors' response: Thanks for noticing. The Figure 1(a) has been revised and the axis legend can now be seen in full.

Authors' changes in manuscript: Fig. 1 was altered, to meet this requirement. The new figure is included.