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Correction

Correction: Yahui, Che et al. Validation of Aerosol Products from AATSR and MERIS/AATSR Synergy Algorithms—Part 1: Global Evaluation. *Remote Sensing* 2018, *10*, 1414

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The authors wish to make the following corrections to this paper [1]:

1. We thank Dr. Andreas Heckel and Prof. Dr. Peter North, the developers of AATSR and MERIS/AATSR Synergy aerosol datasets, who also give professional suggestions on this paper with repect to the AATSR and MERIS/AATSR data used in this paper. We would like to add them into our author list with their agreements. The author list should be "Yahui Che [1,2,†], Linlu Mei [3,*,†], Yong Xue [1,4], Jie Guang [1], Lu She [5], Ying Li [1,2], Andreas Heckel [6] and Peter North [6]". The superscript '6' indicates the "Department of Geography, College of Science, Swansea University, Singleton Park, Swansea SA2 8PP, UK" and their email addresses are a.heckel@swansea.ac.uk for Dr. Andreas Heckel and p.r.j.north@swansea.ac.uk for Dr. Peter North.

2. We have corrected all "product" as "dataset" when referring to MERIS/AATSR synergy retreival.

3. Change "Newly released Swansea University (SU) aerosol products include AATSR retrieval and synergy between AATSR and MERIS with a spatial resolution of 10 km" as "Newly released Swansea University (SU) aerosol products include ATSR-2 (1995-2003) and AATSR(2002-2012) retrieval with a spatial resolution of 10 km. Recently an experimental version of a retrieval using AATSR/MERIS synergy was developed to provide four months of data for initial testing"

4. Page 2, paragraph 4, Change "SU is the only algorithm that provides two different aerosol products: AATSR and the synergy of AATSR and MERIS. Although there is one very recent publication discussing the inter-comparison of these three AATSR Level 2 AOT products, it is limited to China [36]. Until now, there have been no published studies on the global validation and inter-comparison of the two aerosol products provided by SU" to "Comparison of the three products with AERONET is given in [13], and detailed evaluation over China is given in [37]. Until now, there have been no published

studies on the global inter-comparison of the Swansea AATSR aerosol product with the experimental synergy version."

5. Page 2 , paragraph 5, Change "The analysis includes a comparison between AATSR and synergy retrieval" to "The analysis includes a comparison between AATSR V4.21 and the synergy retrieval."

6. The data providers, Dr. Andreas Heckel and Dr. Peter North, have suggested an update with respect to the dataset description in Section 3.2. "A version of the MERIS/AATSR synergistic algorithm for retrieval of aerosol properties has been described in detail by North et al. [44]. This was implemented in the ENVISAT BEAM processor, with the intention of providing aerosol retrieval both as a product, and to allow atmospheric correction of both MERIS and AATSR data. This showed improvement over the equivalent single instrument algorithms in aerosol retrieval, though over a limited dataset, and intended to provide improvements over dark vegetated surfaces only. For the study presented here, a revised algorithm was developed to fit with the compatible Aerosol CCI scheme, and permitted to run over all surfaces to allow a global testing intended for further algorithm development. The synergy algorithm uses the combined wavelengths from both AATSR and MERIS observation, in which the aerosol types are defined the same as AATSR algorithm. Substantial uncertainties in the retrieval of aerosol from multi angle or multi instrument measurements arise from errors in collocation of either forward to nadir images or images between different instruments. To compensate for these uncertainties it is useful to aggregate the individual measurements to 9×9 km^2 super pixels. This aggregation is done differently for AATSR and MERIS data as the two algorithm branches have different strengths and weaknesses. For AATSR, all cloud free pixels within the super pixel are averaged. For MERIS on the other hand only the 20 darkest pixels of the available cloud free pixels are used to compute an average TOA reflectance. This optimisation is based on a linear combination of two separate error metrics for MERIS and AATSR data respectively, but with a consistent atmospheric composition. The spectral error metric used for MERIS is similar to the linear mixing model used in the Bremen AErosol Retrieval (BAER) algorithm [45]. The cloud screening algorithm employed here is a classification approach developed by Gomez-Chova in the frame of the MERIS-AATSR-SYNERGY project [46]. This algorithm provides good results in detecting clouds for the nadir geometry where it benefits from the combined spectral band information of MERIS and AATSR. Unfortunately it does not provide a dedicated cloud mask for the forward view of AATSR. In the context of this option the derived cloud mask is extended by 3 pixels around each cloud to reduce the impact of this draw back. However, cirrus or other clouds above an altitude of 4–5 km are likely to provide contamination, leading to high bias, so the test dataset should be considered valid for cloud-free areas only. Over the ocean, to provide a complete dataset, the same ocean surface model is used as for CCI, and retrieved using AATSR only, but using the MERIS/AATSR synergy cloud mask with twilight zone—differences over ocean indicate differences due to cloud masking only."

7. The first paragraph in Section 3.3. "The synergy algorithm cloud mask is detailed in Gomez-Chova et al. [45]. The twilight zone effect [46] is considered by excluding three surrounding pixels" is corrected as "The synergy algorithm cloud mask is detailed in Gomez-Chova et al. [46], but applied to nadir only. The twilight zone effect [47] is considered by excluding three surrounding pixels to mask some residual cloud." Correspondingly, adding "nadir only" after "Gomez-Chova [46]", deleting "Uses fixed set of aerosol models" in Table 1.

8. One more reference after [35]. The new [36] is "Bevan, S.; North, P.; Los, S.; Grey, W. A global dataset of atmospheric aerosol optical depth and surface reflectance from AATSR. Remote Sens. Environ. 2012, 116, 199–210. https://doi.org/10.1016/j.rse.2011.05.024."

9. The first paragraph is updated "In this section, we present the evaluation results for SU AATSR and AATSR/MERIS synergy retrieval results. The data for the AATSR product can be downloaded from the ICARE Data and Services Center (http://www.icare.univ-lille1.fr/). For the synergy dataset, contact the author (p.r.j.north@swan.ac.uk). Because only four months of data (March, June, September,

and December 2008) have been processed for AATSR/MERIS synergy retrieval, the global comparison will be performed for these four months."

10. Page 7, paragraph one is updated as "However, relatively large absolute AOT differences (over 0.1) are found in regions with relatively low AOT loading (AOT smaller than 0.3), such as Mexico, Southern South America, and South Africa. This may be due cloud cover, the complicated surface cover and high retrieval uncertainty due to less favourable solar view geometry in the southern hemisphere, where we sample the weaker aerosol backscatter from AATSR oblique view. Large predicted uncertainty in the retrieved AOT is also observed in the AOT uncertainty dataset provided by both algorithms."

11. Page 7, last paragraph, Change "Each surface type has a so-called critical surface reflectance (CSR) , over which changes of AOT cannot influence TOA reflectance [50]" to "Each surface type has a so-called critical surface reflectance (CSR) at each waveband, over which changes of AOT cannot influence TOA reflectance [51]."

12. Page 12, paragraph 2, change "more rigourous" to "different"

13. In the conclusion section, paragraph one is changed to "The SU AATSR V4.21 product was compared with an experimental retrieval developed by Swansea University using AATSR and MERIS data for March, June, September, and December 2008 as part of the Aerosol-CCI project. Future work includes (1) investigating of the data qualities over certain regions such as coast line and China; (2) the validation of the retrieval uncertainties, which will be a valuable dataset to analyze and provide a better understanding of the aerosol data." The last paragraph is changed to "The comparison of validation results with the AERONET observations illustrates that the SU/AATSR algorithm exhibits better performance than the SU/synergy algorithm, since a positive bias was introduced in the synergy retrieval of AOD. A number of differences may explain this. The synergy algorithm did not use explicit cloud screening for the oblique view, and the angular component is based on an earlier version than the V4.21 product. Over ocean, despite using identical retrievals on AATSR only, the clear positive bias reported by the synergy algorithm indicates extensive cloud contamination due to lack of oblique view screening. In addition, the application of multiple instruments and multiple views introduces more errors, including those from co-registration between different datasets. Nevertheless, the synergy retrieval achieved similar or better overall correlation with AERONET, with R = 0.9 for synergy and R = 0.89 for the AATSR product. While some positive bias is explained due to incomplete cloud screening in the synergy processing, it is clear also that the initial surface spectra used for the spectral component of the retrieval need to be refined for future versions to reduce bias. This can be informed by similar work on spectral retrievals for MERIS and OLCI [20,21,50,51]. While ability to use full information from AATSR and MERIS ENVISAT instruments is demonstrated, further work is needed to improve treatment of surface spectra in particular to eliminate bias, and to prepare for implementation on OLCI/SLSTR on Sentinel-3."

14. "Author Contributions" part, Add "P.N. and A.H. developed the AATSR and synergy datasets, and contributed to paper writing."

15. Funding part, we added detailed information for CCI project as "the European Space Agency as part of the Aerosol_CCI project"

The authors would like to apologize for any inconvenience caused to the readers by these changes.

Reference

1. Che, Y.; Mei, L.; Xue, Y.; Guang, J.; She, L.; Li, Y. Validation of Aerosol Products from AATSR and MERIS/AATSR Synergy Algorithms—Part 1: Global Evaluation. *Remote Sens.* **2018**, *10*, 1414. [CrossRef]