We would like to thank the Reviewers for the thoughtful comments and suggestions. We have modified the manuscript according to these suggestions. Our replies are below (Reviewer's comments in *Italic*, response in normal face).

Other changes than those suggested by the Reviewers were applied to the manuscript during the revision.
The merging approaches have not been modified, but the number of the products used for merging was revised. TOMS, OMI and EPIC products, which were reported at other than 0.55 μm, were removed from merging. However, we keep those products in the inter-comparison and evaluation with AERONET exercises.
Another product, AVHRR NOAA (over ocean) was added.
In the merging approach 1, the reference to estimate the average offsets with individual products was re-considered: ATSR_ens was replaced with Terra DT&DB. With this change, the overlapping period exists between the reference and all individual products, thus the direct inter-comparison is possible (in the version submitted to the ACPD the offsets between ATSR_ens and VIIRS and ERIC were calculated in two steps, with estimating intermediate offsets to MODIS Aqua).
Section on the estimation of uncertainties in the L3 merged AOD product was added; the spatial and temporal uncertainties are shown and discussed.
In Sect. 6 (revised version), when we discuss the results from different methods for merging annual time series, we now show TOMS (over land) and AVHRR NOAA (over ocean), both shifted to the merged time series (shifted to the reference in the version submitted to the ACPD).
We thoroughly revised the paper, which required an input from a new co-author.

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The current study is divided in two parts. In the first one, an intercomparison among the most widely used aerosols datasets (obtained from spaceborne passive sensors) is performed while at the second one, various merging techniques are applied towards the development of a unified AOD product. To realize, monthly AODs derived by 15 satellite databases are analyzed over the period 1995-2017. The submitted manuscript is too long thus making difficult to the reader to get the information in a straightforward way. Moreover, the authors should make an effort to provide a better description of their merging methodology and their interpretation of the associated findings. Between the two parts, the first one (up to Section 4) can be a stand-alone paper without making substantial modifications while the second one (from Section 5) needs a lot of improvements regarding the description, interpretation and figures (e.g., add legends wherever do not exist, better description in the captions). Therefore, my recommendation to the authors is to split the current version of the manuscript in two separate works thus helping any potential reader to understand the overarching goal of the study as well as its components and the obtained scientific results. Below are listed my comments that should be addressed prior the publication of the submitted text.

The main reason for keeping those two parts of the analysis together is that the evaluation results for the individual products are used for merging. To shorten "part 1", Sect. 4.1 (AOD spatial distribution and diversity) and 4.4 (AOD annual cycles) and some figures from other sections were moved to Supplement; the discussion on the quality of the individual products was also shortened a bit.

1. ***Page 4; Lines 14-16:*** *Is not clear what the authors want to say here.*

The sentence was replaced with “Whereas a lack of diversity among data sets does not mean that they have converged on the true value e.g., AErosol RObotic NETwork (AERONET, Holben et al., 1998) AOD, which is a recognized standard for instantaneous AOD reference, the existence of unexplained diversity does imply they have not.”

2. ***Page 8; Lines 2-3:*** *According to Table 1, there are not available data for 2000 from the AVHRR. Why don’t you use 2001 in order to have full temporal coverage also from MODIS-Terra and MISR?*

   TOMS is not reliable in Nov-Dec 2001. Thus, year 2000 was chosen.

3. ***Section 2:*** *Is there any criterion applied in the monthly products aiming at improving their quality (e.g., temporal representativeness, best quality retrievals) or just the raw products are utilized?*

   Monthly data from the open sources or obtained from the data providers was utilized, except for MISR and AVHRR NOAA (included into analysis during the revision), for which the monthly products were reported at lower resolution. For those, a simple averaging to 1° was applied to match the other products (details in Sect. 2.2). Most of the products do not include the quality flags.

4. ***Page 9; Lines 14-15:*** *Has any significance this threshold?*
   In the revised version, the actual number of the maxima offset (0.011) is given.

5. ***Section 4.1:*** *It would be useful to add a table with the AOD averages over continental and maritime surfaces as well as for the whole globe.*

   The absolute median AOD numbers for land/ocean/globe for years 2000, 2008 and 2017 are in the upper panel of Fig.2; Offsets from global/land/ocean averaged AOD is given for all individual products, when available. Thus, the actual AOD for each product can be easily calculated.

6. ***Page 10; Lines 26-27:*** *Where exactly? In the storm track zone (emission of marine aerosols due to strong winds) of the Southern Hemisphere or in the Southern Atlantic Ocean attributed to the transport of biomass aerosols from the central/south parts of Africa?*

   We added a short discussion on the possible contribution of the storm track zone to the elevated AOD over Southern Ocean and provided the reference.

7. ***Page 12; Lines 25-26:*** *Similar diversity levels are also encountered in the US, Mexico, S. America and Tibetan Plateau. Is there any explanation for that?*

   In S. America (Amazon), the difficulties/differences in cloud screening might be an issue. Big events of the forest fires might be screened as cloud in some products. To check that, L2 AOD and cloud screening results should be intercompared, which is out of the scope of that manuscript. Same for thick dust events. Different assumptions in bright surface treatment might cause another

offset in AOD. However, the AOD diversity is changing there, related to the time period and availability of the products, while over Australia the deviation remains constant along the time.

8. ***Page 14; Lines 23-24:*** *The defined thresholds of Ångström exponent must be modified in order to create a buffer zone between fine and coarse aerosols modes. For example, fine and coarse particles can be "identified" when Ångström is higher and lower than 1.2 and 0.8, respectively. Even though the proposed limits are not the optimum, they are more realistic than the selected ones. An another solution could be the selection of representative AERONET stations for specific aerosol types or aerosol mixtures.*

   First, we wanted to be consistent with previous studies (Sayer al., 2018a, Sogacheva et al., 2018 a, b). The other reason is that in monthly aggregates the aerosol types are defined as a median from the 1-month period, while the presence of other types is possible and often obvious. Thus, such a strict differentiation of the aerosol types, suggested by the Reviewer, is not of great importance in the current study.
   We included to the Supplement the figure (Fig. S5), where for each AERONET station the prevailing annual and seasonal aerosol type has been estimated based on the chosen criteria. There is a sense in the results obtained, which confirms the applicability of the aerosol type classification suggested in the current study. The results also show that aerosol types differ from one Aeronet stations to another in the same region, thus the prevailing aerosol type can't be defined with a high confidence for the chosen regions.

9. ***Page 14; Lines 31-33:*** *I don't agree with the regional averaging of AERONET observations. Instead of giving equal weight on each AERONET site, it would be more correct (representative) to calculate the statistics on the whole AERONET dataset for each region.*

   We tested the approach suggested by the Reviewer, when the study was planned. The validation results for specific areas were often similar with two approaches. However, following the logic that the weight of the validation results might be biased toward the longest time series from a few AERONET stations in the particular area, which are not fully representative for the big region, we chose the other validation approach, explained in the manuscript.

10. ***Page 15; Lines 3-4:*** *How has been defined the spread envelope? Why don't you use only the uncertainty limits defined by GCOS?*

The results for the spread envelope, defined in Sect 4.2 of the version submitted to ACPD, are removed in the revised version.

11. ***Section 4.2.1:*** *The authors should guide better the reader by adding colors corresponding to aerosol groups in Figure 4. Also, rephrase the sentences in lines 13-15 and 25-27. In Figure 4, in the y-axis write that the difference is defined as satellite-AERONET, add a legend and rewrite the caption. Moreover, which is the background AOD? Are there available results for the total AOD without considering different aerosol classes?*

    The legend with the explanation for the colours was added

The explanation to the background AOD was given in the text and now added to the figure caption. The evaluation and the following merging were performed also for all aerosol types (total AOD).

12. ***Figure 5:*** *Clarify that the offset is defined as satellite-AERONET.*

    Clarification was added to the text and y-label caption.

13. ***Page 22; Lines 8-10:*** *Rewrite this sentence because it is not clear.*

    The whole paragraph was revised.

14. ***Section 5:*** *Definitely, a better and more analytical description of the applied merging approaches is needed explaining the benefits and the drawbacks of each methodology.*

    The scheme for the merging approaches was added in the introduction for merging approaches (Sec. 4 in the revised version).
    The description of the applied merging approaches has been expanded and supported by further discussion of the results.
    Section on the pixel-level uncertainties for the final L3 merged product is added.

15. ***Section 5.3:*** *In the RM2, why the levels are 10 and not 9 according to the discrimination of the computed statistics? For example, for the correlation coefficient they have been defined equalrange bins between 0.5 to 1 with a 0.05 step. If I have understood correctly this corresponds to 9 groups of R values instead of 10.*
    With the 0.05 step, 10 bins (groups) exist between 0.5 and 1

1	0.50	0.55
2	0.55	0.60
3	0.60	0.65
4	0.65	0.70
5	0.70	0.75
6	0.75	0.80
7	0.80	0.85
8	0.85	0.90
9	0.90	0.95
10	0.95	1.00

16. ***Section 6:*** *The overarching goal of the current study (stated clearly in the title) is to merge different satellite databases. However, it is not clear to me which is the optimum methodology that should be followed. Also, I fully agree with the rearrangements proposed by the Reviewer #2.*

    The manuscript has been revised considerably by adding the results from the intercompariosn between the products merged with different approached and considering different aerosol types. Based in the inter-comparison results, one merged product was chosen. The summarised

validation results for that product are shown in the new section, which also now includes the inter-comparison between the merged and individual products.

17. **Page 23; Lines 26-27:** *Please explain better this sentence.*

Terra DT&DB was chosen as a reference for offset correction in the revised manuscript. The text was revised accordingly.

18. ***Figure 8:*** *Check if the shaded area corresponds to ±0.04.*

Checked. The shaded area corresponds to ±0.03

19. ***Section 7:*** *It is not clear why this Section is important.*

In the revised version, the merged annual/seasonal/monthly time series are introduced in Sect.6. Difference between time series merged with different approaches is discussed.

20. ***Page 37; Line 7:*** *What do you mean "…AERONET monthly mean gridded dataset…"?*

"gridded" is removed.