**Interactive comment on** “Towards a long-term global aerosol optical depth record: applying a consistent aerosol retrieval algorithm to MODIS and VIIRS-observed reflectance” by R. C. Levy et al.

**Anonymous Referee #2**

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General Comments: The authors describe results of their findings from an experiment designed to evaluate the feasibility to generate a consistent, long-term aerosol record by stitching together aerosol optical depth (AOD) data from MODIS and VIIRS. In the experiment, they apply the MODIS dark-target algorithm appropriately modified to run on VIIRS data. Given the maturity and extensive evaluation of the MODIS aerosol algorithm, as well as the long record of AOD data already available from it, the choice of applying the MODIS-like algorithm to the VIIRS data are both logical and economical.

Generation of a consistent, long-term record of AOD is far from trivial. The sources of major difficulties in this endeavor are clearly indentified and a number of them (sensor, algorithm, sampling, and pixel selection) discussed in detail. The presentation is clear and very readable. The techniques applied are scientifically sound, and the results presented are informative and are useful to characterize the current state of MODIS-to-VIIRS AOD data. The authors acknowledge that a reliable climate data record (CDR) from MODIS and VIIRS “will take much more work”. I fully agree with this statement, but I also agree with the authors’ decision to publish their current results now. Presumably, not all applications need the kind of CDR that satisfies the rigorous definition of an aerosol CDR by the NRC. Applications can tolerate different level of inconsistencies, and providing them with the characterization of this level, as the authors do in this article, enables them to make a decision whether or not to use the AOD record.

Specific Comments: The NRC (2004) definition of a CDR is stated in the Introduction (P6880, L1-5) saying that for an AOD dataset to be considered as CDR, AOD should be measured globally, every four hours, etc. Considering the limitations for AOD retrieval from MODIS (only two daytime overpasses, no retrieval over bright surface by the DT algorithm) it seems the CDR definition cannot be satisfied. This may be construed as a contradiction by some readers, and may need to be resolved.

P6887, L1-5: The Jackson et al. (2013) paper already discusses the VIIRS algorithm with the updated blue/red to SWIR surface reflectance ratios. As they read now, lines 1-5 on page 6887 suggest that the paper has the “at-launch” values.

A reference is made to the VIIRS Intermediate Product (IP) on page 6889 (Line 22). The name may imply that they are not available to the user as the “official” product is the EDR. It would not hurt to point out that the IP are also distributed to users.

P6891, L8-9: It may also be that the VIIRS did retrieve AOD, but it resulted in a negative value, and was discarded as an out-of-range AOD by the QC process.

P6891, L14-17: While it is a legitimate comparison, the seasonal maps shown in Figure
3 may hide substantial sampling differences. Different number of days and/or different number of retrievals within the grid from MODIS and VIIRS could have contributed to the average. In what sense the grids are collocated in Figure 4?

P6898, L9-11: It is stated that ML_V is biased high relative to ML_M over ocean and reference is made to Figure 6. It is hard to see if indeed more ML_V pixels are redder in color that their ML_M counterparts, although staring at the figure for a long time some pixels appear redder.

P6898, L21: What constitutes to the number of possible retrievals? Daytime, cloud-free, dark pixels?

Technical Corrections: P6879, L19: I think you mean “local air quality”, not “local air quality monitoring”.

P6880, L9-10: Recommend writing: “… by their lack of consistent sampling (due to changes in orbit) and calibration.”

P6881, L14: “MODIS Characterization Support Team (MCST)”?

P6882, L9: Change “cannot not help” to “cannot help”.

P6883, L8: “… significantly different than the…” to “… significantly different from the…”

P6883, L23: Sentence “In order to retrieve aerosol…” may need to be revised. Perhaps “The retrieval of aerosol…”.

P6894, L11: NOAA’s Center for Satellite Applications and Research

Figure 4: Labels a and b are missing. Data are plotted on top of the axis and hide the tick marks on the plot on the right.

Figure 10: Labels a, b, c and d are missing from the plots.

Figure 12: top figure colorbar: change “Retreivability” to “Retrievability” in the title.

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Figure 15: Legend: Change “provisional” to “validated”.


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