

Interactive comment on “Vicarious calibration of S-NPP VIIRS reflective solar M-bands against MODIS Aqua over dark water scenes” by A. M. Sayer et al.

Anonymous Referee #1

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This paper assesses the radiometric calibration of VIIRS based on comparisons with MODIS by using aerosol retrievals. It attempts to quantify both the biases, as well as the longterm trend in the calibration of VIIRS relative to MODIS. The study is well done, and the results will be very useful to both the calibration and the aerosol retrieval community. It serves as important feedback to the data producers for further improvements in the calibration. This study also complements the studies by the ocean color teams since both aerosol and ocean color have stringent requirements for calibration accuracy and stability. Therefore, the paper should be acceptable for publication after the following issues are addressed, since the current version lacks clarity in several areas.

Page 1, Abstract. Line 4-9: “reflective solar bands is thought to be biases...”: This

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needs some clarification. First, I assume that the biases you are referring to are the “biases in reflectance relative to MODIS”. However, this can also be interpreted as “biases in AOT due to bias in reflectance”. This may sound the same but they are not. The difference becomes significant when you start talking about +2% and -7% (line 7). Are these numbers in “reflectance”, or in AOT? My understanding is that 1% bias in reflectance is not the same as 1% in AOT. This is a major concern throughout the paper, since it discusses both “reflectance” and “AOT” and often interchangeably. My recommendation is that in the revision, clearly state what it is when you discuss biases and trends. Otherwise, the results are hard to interpret and compare. Also note that 7% bias in “reflectance” would be significantly out of instrument performance specification, while 7% in bias in “AOT” does not have the same meaning.

The second concern is the VIIRS L1 product used in the study. On line 9, it states “standard VIIRS NASA calibration”. However, it is my understanding that there are several versions of the VIIRS NASA calibration. As far as I know, there was the Land-Peate version which evolved into Land SIPS. There is the Atmospheric SIPS, and the ocean color version as well. The authors touched some of these different versions but still it is not clear which version is actually used in this study. Furthermore, even for the same SIPS, there are different versions due to lookup table upgrades. Therefore, it is important to state what specific data were used in this study, preferably very early in the paper. This also becomes important when discussing other versions such as the NOAA IDPS, as discussed later.

Page 2, Line 33: “suggesting calibration biases in excess of 5% in some cases”. This statement oversimplified the situation and may be misleading for two reasons. First, the large biases between VIIRS and MODIS were found to be due to spectral response differences (such as M5, see discussion later). The biases are within 2% after spectral factors are taken into account. In fact, after reaching the “validated” maturity, all bands achieved 2% accuracy except M11, which had a performance exemption since there is no standard to compare against (same issue with MODIS which also has a very

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different spectral response). Second, the studies mentioned here are using the NOAA IDPS data, which is not the “Standard NASA data” that the current study is using so whatever bias values discussed may not be relevant to the current study. Mixing these different data sets only introduces confusion. Note that the NOAA IDPS data suffers from the issue of major calibration changes since launch especially before the validated maturity. The IDPS focuses on near real time (NRT) data production, and has no ability for recalibration on what was generated in the past.

I can see that the authors try to make an argument that VIIRS calibration may not be accurate, but I don't think these arguments here are well founded for the reasons discussed above. Mixing the bias in AOT vs. “reflectance” doesn't help either. Suggest focus on the specific data used in your study and the findings, which should be more convincing in reaching conclusions.

Page 3, Line 33: “describe a vicarious calibration of S-NPP VIIRS RSB against MODIS Aqua. . .”. I think what you are doing is a “vicarious comparison of the S-NPP VIIRS RSB calibration against MODIS Aqua”. The word “calibration” has specific meanings in the context of radiometric calibration, although it may be loosely interpreted as many different activities which can only introduce confusions.

Page 4, line 8, “close to one more MODIS band. . .”, should be “one of MODIS band”?

Page 6, Figure 1: band M3 shows large differences in VIIRS and MODIS mainly because B3 is spectrally very different from that of the VIIRS band. Why didn't the authors use a better matching band of MODIS B10? M3/B10 match much better which should reduce the uncertainties in the analysis significantly.

Page 20, line 26: “is to darken the VIIRS channel by up to ~7%...”. See comments in the beginning. This needs clarification on whether you are suggesting “reflectance 7%” or AOT 7%. The difference is fundamental. If you really found a 7% in reflectance in some VIIRS bands, this would lead to a major review in the VIIRS performance because it would suggest fundamental issues in the instrument which would be new to

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most people.

Page 23, lines 1-5: Several previous studies have shown the large biases of $\sim 7\%$ in M5 and $\sim 3\%$ in M7 (Uprety et al). However, it has been explained in those studies that the biases are mainly due to the spectral response differences compared to MODIS bands rather than due to VIIRS radiometric calibration. As discussed earlier, the authors should clarify whether the bias found in this study is AOT, or “reflectance”. Also, whether spectral difference induced biases have been accounted for, before recommending a correction in the reflectance calibration.

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