

Review of manuscript amt-2017-75

“The effects of different footprint sizes and cloud algorithms on the top-of-atmosphere radiative flux calculation from CERES instrument on Suomi-NPP” by Su et al.

Major comments

This manuscript attempts to quantify the flux uncertainties in the NPP-CERES fluxes because NPP does not have a rotating CERES instrument to generate NPP specific ADM as the TERRA and AQUA satellites had and has to borrow the ADM generated from AQUA satellite. The study uses AQUA MODIS radiances to create simulated fluxes for both AQUA and NPP footprints – going through the same narrowband to broadband conversion and using the same ADM for radiance to flux conversion to isolate the differences due to footprint size alone. The differences due to both footprint size and cloud properties are examined with VIIRS-adjusted cloud properties and subsequent ADM. This study helps to understand and quantify the uncertainty in the current NPP CERES fluxes due to missing its own ADM. However, the description of the methodology could be much improved by adding proper flow chart and naming convention. The other missing piece of information is how the uncertainties estimated with simulated fluxes starting from MODIS pixel radiances are measured against actual retrieved NPP CERES flux? Similar comparisons between the matched NPP and AQUA radiances (Figure 1) could be applied to match fluxes. Likewise, gridded monthly flux differences between the operational CERES-AQUA and CERES-NPP retrievals (similar as Figures 3, 5, 6) would provide an all-inclusive uncertainty that the current simulated uncertainty estimates could put into perspective.

Detailed comments:

1. The methodology description is very confusing. Please explain clearly how each of the three products are produced, use an acronym for each of them and the intermediate products, i.e.,

SNR- Aqua – simulated narrowband radiance with Aqua footprint size

SBR -Aqua – simulated broadband radiance with Aqua footprint size

SBF-Aqua --- simulated broadband flux with Aqua footprint size

2. Need a flow chart to illustrate the methodology. Something like:

MODIS-Aqua -> SNN-Aqua -> (narrowband to broadband conversion) SBR-Aqua

->(MODIS ADM) SBF-Aqua

MODIS-Aqua -> SNN-NPP -> SBR-NPP -> (MODIS ADM) SBF-NPP

MODIS-Aqua -> SNN-NPP -> SBR-NPP -> (like-VIIRS ADM) SBF-NPP2

3. Once product acronym is defined, specify which two products are compared in Figures 3, 5, 6.
4. Line 71-73 From this sentence, it is inferred that one of the CERES instrument on the TERRA/AQUA satellites used RAP scanning mode to create ADM at the beginning of the mission. How long was the RAP mode in operation? Line 82-83 says ADM was created from multi-year CERES measurements from both RAP and crosstrack mode. Does that mean both CERES instruments were used for ADM? Please clarify.
5. Line 119: why do you use different view zenith angle requirement for LW radiance?
6. Figure 1 and Table 1: could you add plots for total radiance comparison between CERES-NPP and CERES-AQUA? Also, the difference in radiances between CERES-NPP and CERES-AQUA could be partly due to different footprint size besides the calibration?
7. Figure 2 Caption: add "CERES" before footprints
8. Line 170-173: The narrow-band to broad-band conversion coefficients are derived from simulated MODIS AQUA radiances and CERES-AQUA broadband radiance. Could these coefficients also be footprint size dependent? The same coefficients are now applied to convert both simulated CERES-AQUA and CERES-NPP footprint.
9. Line 177-178: Actually it would be interesting to compare the simulated CERES-AQUA and CERES-NPP fluxes at footprint level even with different footprint size. How would this comparison differ from the comparison between matched CERES-AQUA and CERES-NPP observations in Figure 1?
10. Figure 4 (cloud property difference between MODIS and VIIRS) and the generation of SBF-NPP2 are better introduced before comparison the three products (Figure 3, 5, 6) to ease the logic flow. Also be specific about difference (MODIS- VIIRS) or the other way?
11. Paragraph: 238-250 how is uncertainty defined?
12. Could you provide a map of difference in ADM?
13. Finally, please have native English-speaking colleagues check the grammar usage. There are many awkward sentences.