Review

The effects of di_erent footprint sizes and cloud algorithms on the top-of-atmosphere radiative flux calculation from CERES instrument on Suomi-NPP

By Wenying Su et al,

This paper studies the effects of different footprint sizes and cloud algorithms on the radiative flux calculation from CERES on Suomi-NPP. Quantifying uncertainties from different footprint sizes and cloud algorithms in CERES-NPP is an important issue in calibration.

However, major revision of the text is needed. The sources of uncertainties in these two CERES (CERES-NPP and CERES-Aqua) observations are not fully explained in the text. The collocated radiances themselves already have 1.5%, 0.5%, and 0.1% of intrinsic differences for each channel, respectively. The sampling errors from two different footprint sizes are also embedded in the radiance comparison.

This study assumes that CERES-NPP and CERES-Aqua are identical instruments with compatible performance. But one may ask if there were improvements in CERES-NPP instrumentation/electronics or calibration. Possible degradation of CERES-Aqua instrument can be mentioned, if any. Before discussing uncertainties from footprint sizes and cloud algorithms, comprehensive uncertainty analysis of two CERES instruments is necessary to quantify errors from spatial sampling and cloud algorithm differences. I understand that this work is the first step towards identification of the two different CERES observations, but further uncertainty analysis and detailed descriptions are required. The methods to identify the effects of different footprints and cloud algorithms need to be described in detail.

1. Introduction : Line 71, Could you provide detailed explanation how two instruments help to construct ADMs that readers can visualize what you described?
2. Introduction : Line 88, “These pixel-level cloud properties are spatially and temporally matched with the CERES footprints ~” ,
   What is the spatial and temporal window for scene type matching from MODIS?

3. Line 126-128,
   “These differences do not show any view zenith angle dependence”.
   Figure 1 compares the radiances of SW, daytime LW, and nighttime LW between two CERES measurements, but does not mention view zenith angle difference. Please explain why these differences do not show any view zenith angle dependence. Daytime LW is derived as the difference between total and SW channels. Nighttime LW is the same quantity with the total radiance because SW radiance is zero during nighttime. How daytime LW difference can be lower than SW difference? Are they offset with bias?

4. Table 1.
   The difference between two cases is largest in SW radiance, but it is less in day time LW radiance. Authors can explain the reason why the difference in daytime LW radiance, which is derived as the difference between total and SW channels.

   Line 212-14,
   "Polar region cloud fraction differences are mainly because (that) VIIRS lacks the water vapor and CO2 channels which affect the polar cloud mask algorithm." Please explain how lack of those channels cause polar region cloud fraction difference. While VIIRS shows less cloud fraction over northern high latitude snow regions, it shows more cloud fraction over arctic. If all positive and negative difference is caused by large uncertainty of VIIRS, then more explanations on VIIRS cloud retrieval limitations including usage of different parameterization over snow/ice surfaces and uncertainty caused by this difference should be mentioned.

   Line 158 are used to derived → are used to derive

5. Conclusions

299 How these simulations helped to calibrate CERES-NPP observations?
306 How much is the uncertainties of CERES ADMS as appeared in Su et al (2015)?

314-316 VIIRS and MODIS cloud retrieval algorithms are not consistent. Then it is important to quantify the differences and reflect them to improve the CERES-NPP algorithm. Last sentence, "To maintain the consistency of the CERES climate data record, it is thus important to maintain the consistency of cloud retrieval algorithms." does not help much to solve the problem.