

## Review #1

### General comments:

1. Whereas the overall research is of great importance as the various EOS algorithms are moving into the JPSS era, this paper is plain and simple incomplete. The authors give a pretty good discussion of the footprint size difference estimation experiments, in the title and the abstract they speak of retrieval algorithm differences as well, yet in the text the treatment of retrieval algorithm barely gets a sentence or two. I feel like the entire discussion of the retrieval algorithm is missing. In research it is important for published result to be reproducible to at least some degree. This work is definitely not reproducible. The footprint difference evaluation needs more detail and the algorithm difference evaluation plain and simple needs to be written.

*Thank you for your time to review this paper. We added a paragraph on page 9 to provide more details on the cloud retrieval differences between MODIS and Aqua. We also revised the method section extensively with the new diagram (Figure 6) to illustrate the simulation process.*

2. Throughout, please consider the audience may not know what your different acronyms are. Please expand in text or provide an acronym table.

*We defined all the acronyms in the paper.*

### Specific comments:

Line 7: CERES, first mention of the instrument, please expand

*We defined CERES in the title, which should give reader a reference.*

Line 12: same thing for VIIRS and MODIS, consider the audience may not know what the acronyms are.

*Defined.*

Line 26: “cloud property differences”, elaborate what exact cloud properties you mean

*Defined the cloud property as “cloud fraction and optical depth”.*

Line 48: “flied” is not a word

*Thank you for catching the typo, corrected.*

Line 49: “were launch” is grammatically incorrect

*Corrected in the revised version.*

Line 56-57: spacecrafts is not a word

*We replaced “spacecrafts” with “satellites”.*

Lines 115-117: why have you not considered the scattering angle?

*The scattering angle is intrinsically considered here, as  $\cos(\text{scattering angle}) = \cos((SZA)\cos(VZA) + \sin(SZA)\sin(VZA)\cos(RAZ))$ , where SZA is solar zenith angle, VZA is viewing zenith angle, and RAZ is relative azimuth angle.*

Line 128: “the nighttime LW radiance is simply from the total channel measurements” doesn’t make any sense.

*We don’t quite understand the reviewer’s comment. As we stated in the paper, the CERES instrument measures radiances in shortwave, window, and total channels. For daytime measurements, the longwave radiance is derived as the difference between total channel and shortwave channel. For nighttime measurements, the shortwave radiance is zero thus the longwave radiance is the same as the total channel. We changed this sentence to “the nighttime LW radiance is directly derived from the total channel measurements” to be consistent with the previous sentence.*

Line 157: snow /no snow conditions, how are you getting this information?

*Snow information was obtained from the national snow ice data center and is included in the CERES SSF data. Detailed description is added on page 5.*

Line 159: “to derived” is grammatically incorrect

*Corrected, thank you!*

Line 163-166: how are you getting snow/no snow information?

*Snow information was obtained from the national snow ice data center and is included in the CERES SSF data. Detailed description is added on page 5.*

Line 178: replace ‘assessed’ with ‘ascertained’

*Changed.*

You talk about the simulated footprint generation, but where is the discussion of the algorithm differences? “We tweaked it” is not good enough.

*The cloud algorithm difference between MODIS and VIIRS cloud retrieval are discussed on page 9. However, please note that addressing the cloud retrieval difference is not the focus of this paper. The main focus of the paper is to address the effect of footprint size and cloud retrieval differences on flux inversion. We don’t understand where “We tweaked it” is coming from, as we didn’t use any wordings like that in the paper and therefore unable to address the reviewer’s comment.*

Line 192: “that consist with” is not English, “result in less footprints” is not either.

*We modified the sentence to “as the narrowband-to-broadband regressions are only applied to footprints that consist of the same surface types which result in fewer footprints with valid fluxes for CERES-NPP than for CERES-Aqua.”*

Line 204-210: Why? Please explain

*Explanations of the cloud fraction and cloud optical depth differences were given on lines 197-205.*

Line 224-227: This does not make any sense to anyone who might theoretically even consider checking your results.

*Readers who might want to check our results can download the CERES-Aqua and CERES-NPP SSF data and calculate the daily ratio for each 1 degree by 1 degree grid box using the cloud fraction and cloud optical depth of the CERES footprints.*

Line 235: Why did your flux increase? Explain

*CERES flux is derived as:  $\pi$ \*radiance/anisotropic factor (see Equation 1 in the revised manuscript). As we explained in the paper, for oblique viewing angles, the anisotropy factors for thick clouds are smaller than those for thin clouds. As anisotropy factors decrease when retrieval cloud optical depths increase, the inverted fluxes increase (as the radiances didn't change). We understand this part might be confusing, to help reader better understand how we derive flux from CERES radiance measurements, we added some descriptions in the introduction section.*

Line 273: replace 'is' with 'are'  
*Modified.*

Line 275: replace 'these' with 'that'  
*We rewrote this sentence.*

Line 282: replace 'thus' with 'to'  
*Changed.*

Comments on figures:

Figure 2: so these CERES footprints are misaligned like that in real life or just in illustration. Please clarify.

*We rewrote the paper, and Fig. 2 is replaced with the flow chart (Fig. 6). The original Fig. 2 is just for illustration, not how CERES footprints look like in real life.*

Figures 3-6: can't be evaluated because I don't know what I'm looking at. There is no explanation in the text as to why the images look they way they do. Could be a thousand different reasons, so figures do not make sense.

*We modified the paper and the captions of these figures to make it clear to readers.*