Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2019-87-RC1, 2019

Earth System Science Data Discussions

Interactive comment on "Geometric accuracy assessment of global coarse resolution satellite data sets: a study based on AVHRR GAC data at the subpixel level" *by* Xiaodan Wu et al.

Anonymous Referee #1

Received and published: 5 September 2019

SUMMARY: This study assessed geometric accuracy of global coarse resolution satellite data sets via a Correlation-based Patch Matching Method (CPMM). This study aimed to quantify the AVHRR Global Area Coverage (GAC) at the subpixel level from three different satellite products from the NOAA-17 and the Meteorological Operational Satellites (MetOp-A and -B). This study selected multiple study regions to evaluate the potential influence factors such as satellite zenith angles, latitude, longitude, and elevation. The findings of this study supported that CPMM succeeded in quantifying uncertainties of in different satellite data and identifying key influence factors/sources in their uncertainties. However, there is a major comment about the robustness of this method for more other cases. In this study, this method was evaluated for the sin-

gle dates (August 13, 2003 for NOAA-17 and March 12, 2017 for MetOp-A and -B). Based on the results from a single date, the robustness of this method is still in question. As authors mentioned in the manuscript (line 34-36), an advantage of AVHRR sensors is that they have a long-term data since 1980s, which enables us to analyze it at the climate time scales. The findings of this study is more likely a case study of the geometric accuracy assessment for a single satellite imagery data. Another major comment is related to the scientific representation, particularly the figures. What do the Y-axes of Figure 5, 6, and 7 represent? It is not clear what 0.8 (in Figure 6 (a)) or 4 (in Figure 6 (e)) meant assuming that the sum of the density of all the bins should be either 1 or 100. Please clarify the maximum value of the density. Secondly, Figures 5, 6, and 7 showed the histograms along the shifts in the along-track and across-track directions ranging from -8 and +8 kilometers with an interval, 500 meters over different study regions. Can authors show the changes in correlations along the shifts in the along-track and across-track directions as well? Here is a suggestion that authors can plot bi-histograms of 1,089 (33 x 33) samples along the shifts (the x-axis; blue for the along-track direction and red for the across-track direction) and correlations (the y-axis). Based on Figure 3, the correlations are various depending on the shifts in the directions. It might be worth showing these changes along the shifts as well. Based on these major comments, the topic and scope of this manuscript are well fit to ESSD but it is publishable after major revision. Minor comments are provided below:

Minor comments:

Line 9: Global Area Coverage (GAC), not GAC (Global Area Coverage).

Line 34: "are" instead of "is"

Line 61: What does "reduced resolution" mean here? Maybe "coarse resolution"?

Line 81: What are "certain conditions"? Please explain it in more details.

Line 82-83: ". . . but *it* depends on . . ." Also, is this sentence based on previous stud-

ies? If then, please cite the reference. Line 100-101: The sentence is not clear. Maybe "to test some satellite data from NOAA-17, . . ."

Line 165-166: Please consider to change the ROI numbers. For example, for the mountainous areas, the ROI numbers are 1, 2, and 3 (currently, 2, 4, and 6, respectively). For the flat regions, the ROI numbers are 4, 5, and 6 (currently, 1, 3, and 5).

Figure 2: Please use different ROI labels since they are different from regions of interest in Figure 1. It is confusing if the numbers are used for ROI labels in Figure 1 and Figure 2. I suggest authors to use letters for ROI indicators (e.i., A, B, C, D, E, and F) in Figure 2.

Line 187: "CCM", not "CGM".

Line 187: land-sea fraction method (LFM) since the full name of LFM appeared in line 76.

Line 187-191: These sentences are redundant. Please remove them.

Figure 3: Please use white filled boxes or arrows, instead of blue filled boxes or arrows.

Line 218-219: I have a major concern about the robustness of this method for other regions and other seasons. Please see my first major concern above.

Figure 4: Please use a larger range of the color scale. It is hard to find the grid cell/location of the maximum correlation.

Line 275-277: Mean and standard deviation are parametric statistics of the data that are from a normal distribution. However, the shifts might be not well fitted to a normal distribution (based on Figure 3). I suggest authors to use the median of the shifts and their first and third quartiles.

Line 282-283: Please rewrite this sentence in the order of ROIs 5 and 6.

Line 284 and 286: "ROIs *1, 3, 4, and 7*" Is there any reason to keep the order of ROIs

(7, 3, 1, 4)?

Line 291: "ROIs 2, *5, and 6*"

Figure 5: Please state what the blue and red histograms represent.

Table 2, 3, and 4: Please add the elevations of ROIs. This information will be helpful for readers to understand the impact of elevation on the accuracy.

Figure 8: "SatZ (*a-f*), longitude (*g-i*), and latitude (*j-l*)"

Line 495-496: Please remove this sentence.

Line 499: ". . . within the range *between* -8° *and* 0° *(Fig. 8 h and i, respectively)*".

Line 558-559: As authors mentioned, this study was conducted only for a single scene. It questions: 1) is this study novel enough to contribute to various applications of the satellite data used in this study (particularly for climate research)? Or, was conducted a comprehensive assessment for the robustness of this method. The current results are more likely based on a case study for geometric accuracy assessment of coarse resolution satellite datasets.

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