Atmospheric
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Discussions

Interactive comment on "Uncertainties of satellite-derived surface skin temperatures in the polar oceans: MODIS, AIRS/AMSU, and AIRS only" *by* H.-J. Kang et al.

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General Comments

This analysis of MODIS, AIRS+AMSU and AIRS-Only surface skin temperature data sets could potentially provide useful information to the numerical weather prediction and climate communities about the proper use and interpretation of surface skin temperature products. In the following specific comments, I have some questions/comments/remarks about the analysis that, if addressed, would add necessary clarity to the published version of the paper. In addition, I found that the paper would

benefit by making edits as directed in the specific comments.

Specific Comments

Line 9 – "Department" not "Deptment"

Line 30 – Recommend the phrasing "warmer up to 1.65K" and "colder down to -2.04K" instead of "up to 1.65 K warmer" and "up to 2.04 K colder"

Line 41 – What about the Southern regions? You only give trend values for the Northern regions only here.

Line 43 – Was the temperature disagreement found to be statistically significant or not? This seems like this would be information that could be included in the Abstract.

Line 47 – Recommend to use "challenging" as opposed to "challenged"

Line 62 – The statement "The AIRS instrument suite, with its microwave instrument. . ." leads me to think that AIRS is a suite of instruments. This is not the case. Did you mean to put "AIRS/AMSU" here, or maybe "EOS-Aqua?"

Line 69 – Recommend "Earth Observing System (EOS) Aqua" here instead of just "Aqua."

Line 86 – "The possible reasons for this include the satellite local crossing time (LCT) difference." I don't understand this statement, as all of the instruments are on the same platform, thus have the same LCT. Please explain.

Line 91 – Recommend changing ". . . different datasets" to ". . .different SST datasets" and remove the ")" after AMSU.

Line 105 – Don't need second "." after "p.m."

Line 115 – The question is coming up for me at this point regarding the effect of surface emissivity changes that may arise in the MODIS, AIRS, and AMSU data. How might this affect your analysis and results? A discussion of this needs to be in the paper if it

is not.

Line 124 – Recommend "bands 31 and 32 are centered" instead of "bands 31 and 32 centered"

Line 126 – The question comes up for me at this point: What about the case where sea ice may cover a fraction of the radiometer pixel? Is this determined in some way? How might partial coverage of sea ice in a pixel affect your analysis and findings? If you have not discussed this impact, this needs to be added to the paper.

Line 142 – Recommend to use the wording "The AIRS/AMSU algorithm is independent of the GCM, except for the use of GCM surface pressure to determine the bottom boundary conditions" instead of "The AIRS/AMSU algorithm is independent of the GCM except for the surface pressure of the bottom boundary conditions"

Line 148 – Does the case where water pooled on sea ice have any relevance here? For example, it may cause misclassification of sea ice. If so, is this accounted in your study? I think it at least deserves a mention in the paper, if it has not been mentioned.

Line 175 – What do you mean by random sampling? What was randomly sampled? I am assuming data, but a couple of sentences to clarify what data and at what locations may be helpful to me. Even the whole globe at 1 degree by 1 degree is less than 10,000 trends . . . and you only focus on the poles in this study. I am not sure how you create so many trends.

Line 183 and 184 – ". . . in the case of MODIS data present over 50% . . ." and ". . . this 50% criteria was used." What do you mean here? The number of 9-day samples for a given year at a given point is greater than or equal to 5? Or do you mean something else? I'm sorry, it is not clear to me. Can you please explain?

Line 188 – It is fine that you don't repeat the Northern Hemisphere results here, but I think it is worth simply mentioning whether or not the Northern Hemisphere results are similar in nature to the Southern Hemisphere results.

C1192

Line 190 – I though for this study that you used only MODIS data when there were more than 10 samples in the 12-year period? See Line 172.

Line 204 – Recommend to find a uniform way of expressing cooler biases. Is it +2 K lower or -2 K lower? Can be confusing.

Line 241 – I would not call this "inter-annual variation". I was expecting a single map figure showing a standard deviation of the annual values. I would call this instead "annual-average spatial distributions."

Line 251 – Are there any in-situ validation data for any of these products? There is the assertion in this line ". . .which must be related to the difference in the surface type characterization." It is starting to concern me that there is no anchor point from which to discuss which of the products may be providing the most reliable results. The utility of a model study is highly limited if we don't understand the validity of the model relative to observations. Are their validation studies that can be referenced in this paper?

Line 254 – "types" not "ypes"

Line 260 – Recommend "exceed" instead of the word "overestimate".

Line 279 – Recommend to change "presented" to "presents".

Line 290 – Recommend restructuring this sentence from "It is hard to see the systematic difference over the northern hemisphere due to the sea ice detection because of the distribution of continent if Fig. 3a." to the following: "It is hard to see in Fig. 3a the systematic difference due to sea ice detection over the northern hemisphere because of the continental distribution.

Line 292 – Recommend to remove the word "also".

Lines 292 and 293 – Instead of the words "overestimated" and "underestimated", maybe use the words "warmer than" or "cooler than" respectively. The use of the words "overestimated" and "underestimated" makes it sound like Tskin(AA_V6).

C1193

Line 296 - Instead of "in broader region", needs to be "in a broader region".

Line 298 – Choose a convention for negative biases. Here, you don't put a negative sign in front of this negative bias. In other parts of the paper you do.

Line 331 and 332 – "MODIS IST was calculated on the snow, sea ice, and ocean assuming the surface was snow (sea ice)." Please clarify this statement, as what I am interpreting is that snow, sea ice and ocean are all assumed to be sea ice. Is this true?

Line 341 – Recommend to change "2003-2014", to "2003-2014 in the southern hemisphere".

Line 370 – Are there any surface based data that back up the satellite observations?

Line 404 - In regards to the results of the lower section of Table 4: I am struggling to understand what the justification is for focusing the analysis only of those data that have the same sign as the temperature difference. Of course this will show that you will get a trend difference that is the same sign as the temperature difference in this case. The thought that comes to mind is that you are reducing the data set to get the answer you want to see. Please elaborate on why you subsetted the data in this way.

Line 423 - See comment for Line 298.

Line 423 – I am having trouble understanding the phrase "Tskin(MODIS) was higher by up to 1.65K than on the boundary". Do you mean "Tskin(MODIS) was higher by up to 1.65K than Tskin(AA_V6) on the boundary"?

Line 424 – The term "The spatial correlation coefficient" is not clear to me here. Are you referring to the results in Table 2? Do you mean the correlation coefficient computed in latitude bands?

Line 427 – See comment for Line 298.

Line 437 – See comment to Line 404.

C1194

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