

Comments from author are in blue

General Comments

P3L6-14: Added Section 2.1 (Data sources) to address the general comments as a whole.

It's unclear to me which platforms of MHS and AMSU-B you are using in this analysis. On Page 3, line 17 you only mention NOAA16, NOAA17, NOAA18, and the Metop (both A and B?) satellites. Are those the only platforms you're using? What about NOAA15 (AMSU-B) and NOAA19 (MHS)?

P3L8-9. The description of the possible data sources should have included all satellites with AMSU-B or MHS on board. Fixed that now.

When evaluating your retrieval in Section 3, you mention using an overlap period of 2008-2009, so are you combining all the MHS and AMSU-B platforms together? What about potential differences among the similar sensors? While the MHS sensors are fairly similar to one another, the AMSU-B sensors have been shown to have very significant calibration differences (see for example, Chung et al, 2013: "Intercalibrating microwave satellite observations for monitoring long-term variations in upper- and mid tropospheric water vapor" and Moradi et al, 2018: "Radiometric correction of observations from microwave humidity sounders"). It would be helpful to include a description of where the AMSU-B/MHS data are from and if there are any calibration corrections or intercalibration applied. As shown in the papers I previously listed, NOAA15 and NOAA16 show some significant calibration issues in the 183 GHz channels later in life, so the 2008-2009 time range selected for Section 3 would be impacted, unless you can show that the calibration differences between the sensors do not matter for your retrieval.

P3L6-14: Summarized in Section 2.1 which platforms the data comes from: Always NOAA-17 for AMSU-B, from the NOAA Fundamental Climate Data Record. Always NOAA-18 for the MHS case.

Also in regards to the AMSU-B/MHS dataset, it would be nice to see a better description of the data availability and the instrument characteristics. You have the frequencies listed in Table 1, but you don't reference this table until late in the text when it would be helpful to know these details earlier as you are referencing channel numbers.

P3L10: Now Table 1 is referenced in Section 2.1.

Also, it would be helpful to include a plot or table showing data availability of the instruments. You mention using an overlap year of 2008-2009 in Section 3, but an overlap of which platforms? Without prior knowledge of the sensors this wouldn't make sense. Showing the period of time each sensor was active would help with this.

P3L10/P 29. Added Table 2 mentioning platforms and sensors.

Specific Comments

Page 6, line 26. "The worst slope... unexpectedly small amount of data". I'm confused about this statement.

According to the table, December does not have the lowest number of data points, so it doesn't seem appropriate to say this lowest correlation may be related to the number of data points. And why is the number of data points "unexpected"? It's not clear to me why you say that.

P7L12-13 For a winter month, this amount of data is small (comparing the 7723324 points in December with the 10691385 in January or 9858305 in February). Hence, the description of the

In Figure 8, it appears that you do get a lot of overlap between the AMSRE and AMSU retrievals for July, while in Figure 7 the case that you show has no overlap. It was a little confusing to go from your statement on Page 7, line 26 saying "in summer the overlap area is zero" and just a few sentences later you show overlap in the summer in Figure 8. Did you apply the ice cloud mask to Figure 7 and that's why there's no overlap? I realize that Figure 7 is just a day and a different year, but it might be better to show a case where there is some overlap just to be more consistent with Figure 8. Also, it appears in Figure 8 that there are double the number of overlap points in the summer as in the winter (left column) which would also seem to contradict Figure 7.

We address this with two different things:

P9L10-15 I modified the description of Figure 7 (now Figure 11) and the overlap area in general from just indicating that in this particular day there is none to 'in summer this overlap area is small, and in this particular example, the overlap is zero'.

P9L20-25 First, I extended the calculations for Figure 8 (now Figure 13) to three years in total (2006-2008). Additionally, I fixed an issue with this data: in the former version of the paper, there was some spurious overlapping data from the Extended sub-algorithm for Open Water surfaces developed in Scarlat et al, 2018. Hence, the summer overlap between AMSU-B and AMSR-E presented now in Figure 13 is mostly data that needs to be removed by the ice cloud mask.

Page 7, lines 22 and 31. In line 22 you say that the upper limit is 15 kg/m^2 , but then in line 31 you say the upper limit is 7 kg/m^2 . Which one is it?

P9L7-8 and P9L19. Both are correct, but the phrasing was really vague. Corrected to specify how the different upper limits mentioned in each case are for different surfaces (since the extended algorithm with emissivity information is only applied to sea ice surfaces).

P5L20-31/P30 Reformulated Section 2.5 to better describe the different retrieval regimes and their working conditions, added Table 3 as summary.

Technical Corrections

Define AMSU-B and MHS the first time they are used.

P1L7. Defined in the abstract now

Please include the references currently marked with a "?" on Page 6, line 10 and Page 7, line 10.

P6L25; P7L25. Fixed issue

Page 6, line 15. Do you mean ± 7 instead of ± 1 ? Channel 20 is 183 ± 7 GHz.

P7L1. Yes, I do. Corrected.

Page 7, line 25. "red area" - should say "orange"

P9L11. Corrected.