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# ***Interactive comment on “A method for merging nadir-sounding climate records, with an application to the global-mean stratospheric temperature data sets from SSU and AMSU” by C. McLandress et al.***

## **Anonymous Referee #1**

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### Summary:

This paper proposed an approach to merge the global mean SSU and AMSU observations using MIPAS as a bridge, accounting for residual biases between the two observations which were left over from directly merging the weighting functions of the two observations. The merging results were reasonably well, given by near zero difference time series between the SSU observations and its equivalent merged AMSU observations during their entire overlapping period from 2001-2006. The paper then compared

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the merged SSU/AMSU observations with MLS observations and chemistry-climate model simulations. Favorable results were obtained for both of the comparisons. The approach is potentially useful for other nadir-sounding observations even when no overlaps exist between them as long as a bridge exists from the limb-soundings to link the nadir-sounding observations to be merged. Although the merging approach appeared to be useful and the results were interesting, I have a major concern on the conclusion and some specific comments relate to it. I recommend publishing the paper only after these issues were suitably addressed. These comments are listed below.

#### Major Comments:

In the abstract, the authors stated that the ‘The extended SSU data set also compares well with chemistry-climate model simulations over its entire record’ and Figure 7 gave the comparison results. However, the chemistry climate model simulations in Figure 7 extended only from 1979 to 2006 where the SSU-only observations were available for the entire period. It is desirable to understand how the SSU-only observations compare with climate model simulations. In my view, this conclusion has nothing to do with the merging and extension. Good agreement between the merged SSU/AMSU observations and chemistry climate model simulations should be due to good agreement between the NOAA SSU Version 2 data and model simulations. This is because only if the SSU observations agree well with model simulations, good merging between SSU and AMSU could also agree with model simulations. Otherwise, good agreement between the merged observations and the model simulations cannot be achieved unless the merging is poor. To my knowledge, independent studies by other groups (not published yet) also suggested that the NOAA Version 2 SSU data agreed very well with model simulations. It appears that the conclusion of this paper claims a credit or achievement that does not belong to the proposed merging approach. This should be addressed in the revised manuscript.

#### Specific comments:

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1. Page 4, lines 10-15: It should be noted that the NOAA Version 2 SSU data and its paper by Zou et al. (2014) intended to address the differences between climate model simulations and observations found in Thompson et al. (2012) paper. The NOAA SSU Version 2 data had big improvement over its Version 1 data and how this improvement resolves the mystery of the stratospheric temperature trends need to be addressed here—since, as mentioned in my major comment, this is a key issue that will affect the SSU/AMSU merging and its comparisons with climate model simulations.

2. Page 5, lines 20-25: Again, the NOAA SSU V2 data are critical for interpretation of the merged SSU/AMSU data and its comparisons with climate model simulations. More information should be provided here on this dataset such as its improvement over V1 and spatial and temporal resolutions, etc.

3. Page 6, line 5: I noticed that most of the results presented later on were from 2001. The authors should clarify here how starting dates of different channels affect the merging.

4. Page 8, lines 1-5: ERA-I and its adjustment were not fully justified for long-term trend investigations, especially for SSU channel 3. I don't see how including this dataset will help justify the conclusions of this study. I recommend removing ERA-I to focus on the SSU/AMSU merging and its related analysis in this paper.

5. Page 18, lines 1-5: As mentioned in my major comments, the good agreement in Fig. 7 has nothing to do with the SSU/AMSU merging. I recommend to only including the SSU V2 data in this comparison (Fig. 7), while adding another plot to compare the merged SSU/AMSU data with CMIP5 data where one can extend the time series to 2011 or present.

6. Page 18, lines 5-15: See my comment #5. Since the authors already did this, I recommend to including the plot showing comparisons between CMIP5 and the merged SSU/AMSU data from 1979-2011.

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