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Atmospheric Measurement Techniques Discussions

Interactive comment on "Lidar temperature series in the middle atmosphere as a reference data set. Part B: Assessment of temperature observations from MLS/Aura and SABER/TIMED satellites" *by* Robin Wing et al.

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Response Lidar temperature series in the middle atmosphere as a reference data set. Part B: Assessment of temperature observations from MLS/Aura and SABER/TIMED satellites Referee #2

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The main weaknesses of the current manuscript are: 1) the short (and old) time span of the comparisons knowing that all 3 instruments in question are still operational today,

and 2) there is little, or no, investigation of the differences that are not explained only by altitude shift. To this respect, I encourage the authors to invite the MLS and SABER temperature validation teams to provide their inputs (and possibly add them as co-authors)

I have extended the analysis from 2011 to 2018 by using the temperature profiles from LiO3S (which were validated in Part A) to fill in the gaps in the LTA data record. It is important to note that LiO3S is a stratospheric ozone lidar and was not designed to measure temperatures high into the mesosphere. As I result I have increased the vertical integration for these profiles. Text has been added and modified throughout the article to accommodate these changes. Figures 3, 4, 5, 6, 10, 11, 12, 13 have been updated.

I have contacted both the SABER and MLS teams and offered co-authorship and to make any required changes to the article. Investigators either declined co-authorship, didn't positively indicate a desire for co-authorship, or didn't respond.

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I therefore suggest publication after major revisions, which: 1) Include a longer time period (e.g., 2004-2017) 2) Include inputs from MLS and SABER satellite teams 3) Include further investigation of the observed differences that may arise from lack of temporal and horizontal co-location

1) I have extended the analysis from 2011 to 2018 by using the temperature profiles from LiO3S to fill in the LTA data record. See response to previous comment.

2) See response to previous comment regarding input from MLS and SABER teams.

3) Dawkins et al, 2018 was published last month and presents a systematic comparison of 9 lidar sites with SABER. In this article they show the effect of small variations in co-incidence criteria have little real difference on the comparison. They used similar horizontal co-location criteria to what I first presented here.

I have added a discussion of Dawkins et al, 2018 to this paper.

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Line 59-60: Schwartz et al, 2008 should be included here. Also, check more recent publications (for e.g., referring to GOZCARDS)

Schwartz et al, 2008 does not compare MLS to a lidar but the reference has been included in the conclusion along with the following text:

“The results of this study will be useful for any future satellite validation studies in the style of (Schwartz et al. 2008) where lidar data could be used as a reference dataset. In particular, lidar - satellite bias study results are useful for the ongoing NASA project "The Mesospheric and Upper Stratospheric Temperature and Related Datasets" (MUSTARD) which seeks to merge historic and ongoing satellite datasets.”

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Figures 3 and 5: I suggest showing the temperature fields as well, at least for lidar, and preferably for both lidar and satellite. This way, differences on the 2D contour plots can perhaps be associated with specific temperature features

Figure 2 has been added with an example of a nightly co-located temperature profile from the lidar, MLS and SABER. The 2D temperature fields for the lidar and satellites are not particularly informative. You can see the annual oscillation and some time periods where the lidar data was not so great (isolated periods after 2010 and in particular around 2015) but picking out particular features by eye is challenging. Attached 40 years OHP lidar temperatures.

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Lines 255-260: There is little quantitative discussion of the temperature uncertainties throughout this manuscript. Although I understand there is a "Part 1" manuscript, a figure showing typical systematic, random and total uncertainties for lidar, MLS and

SABER, as a function of altitude, would be very useful.

Figure 2 has been added with nightly mean temperature and uncertainties. Part 1 of this paper has been modified to include a presentation of lidar uncertainties.

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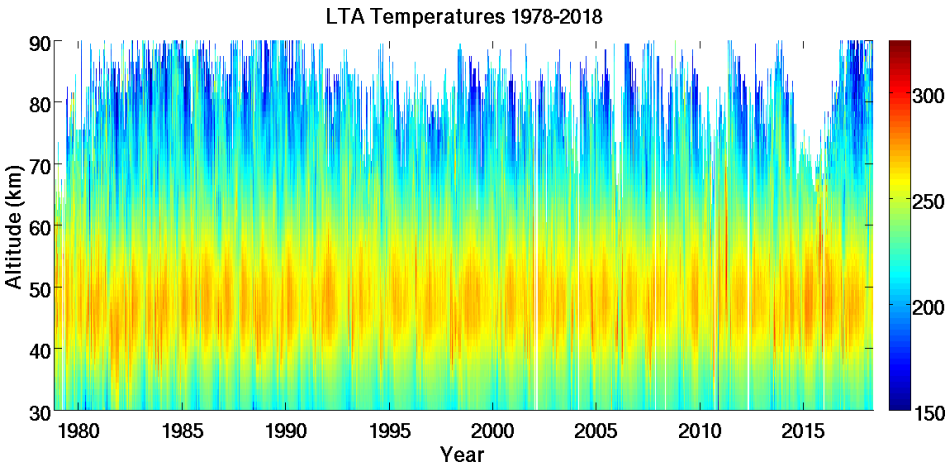
LTA Temperatures 1978-2018
Altitude (km)
90
80
70
60
50
40
30
1980
1985
1990
1995
2000
2005
2010
2015
Year
300
250
200
150

Fig. 1.