

## ***Interactive comment on “Temperature decadal trends, and their relation to diurnal variations in the lower thermosphere, stratosphere, and mesosphere, based on measurements from SABER on TIMED” by Frank T. Huang and Hans G. Mayr***

### **Anonymous Referee #2**

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The authors have used temperatures obtained from SABER data to extend study about the local time variations of temperature trends from 2002 to 2014, 20 to 100 km, and 48°S to 48°N latitude. The trends found have been compared with those published and after some discussion the authors found that temperature decadal trends for a fixed local time were different from trends at another fixed local time. In addition, the authors also found that the amplitudes and phases of the tides also revealed decadal trends, and they inferred that thermal tides likely count to contribute to the local time

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variations of temperature trends.

Based on my evaluation, this is an important scientific contribution which can help to clarify differences and achieve more consistent trend results. However, there are some concerns that need to be addressed.

1)The introduction can be improved in order to clarify the findings in previous works and the difference from present investigation. The authors have discussed this issue, however the way it is written has become confused.

2)One of the main results found by the authors concerns the contribution of thermal tides to the local time variations of temperature trends, since their amplitudes and phases also display decadal trends. In this sense, Figure 2b should be further explored in order to show readers how the variation in thermal tides contributes to the local time variations of temperature trends. The same can be considered in sections 4.1 (Stratosphere) and 4.2 (Lower Thermosphere), where the relationship between the thermal tides and the trends should be emphasized.

3)The diurnal tide on temperature in stratosphere (~ 40-50 km) has its strongest amplitudes at latitudes 40°N, S, while in the MLT region (~ 85-95 km) they are strongest around the equator, where the phases are best resolved. Therefore, I would like to suggest adding the analysis of trends in the amplitudes and phases of the diurnal tide for these regions, which may provide enrichment in the discussion of results.

4)The theme of the section 4.3 (Orbital drift and generic) needs to be improved and explored. It could be moved to section 2 without prejudice to the manuscript.

5)Discussion should be made more rigorous. The basis for the statements needs to expand further.

Technical revision

Please check the citations through the text considering the rules required by the journal.

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Page 2, line 82: change “Advanced Microwave Sounder...” by “Advanced Microwave Sounder Unit”

Page 7, Figure 3b,c,d: legend overlap with plots

Page 11, Figure 7: legend overlap with plots

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