

Interactive comment on “Seasonal variation of temperatures between 1 and 105 km altitude at 54° N observed by lidar” by M. Gerding et al.

Anonymous Referee #1

Received and published: 22 October 2008

This paper describes a climatology of the temperature above Kuhlungsborn (Germany) performed with a lidar. This contribution can be seen as a following a previous similar works (well cited) performed on different datasets at different latitudes. The methodology of harmonic decomposition is not new but this study is a valuable contribution. The most original part concerns the instrument itself that is based on coupling different lidar techniques to perform a continuous profile from ground to nearly 110 km.

This publication is clear, well written and organized. It gives valuable information about the quality of the data and referee to an adequate bibliography. Please found after few comments that need to be discussed:

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1/ The harmonic analyses is well handled, however only qualitative comparisons with previous lidar works are given. Is it possible in using CIRA or MSIS to evaluate differences in using such climatology models as a geographical transfer to be able to see if differences observed at other sites are similar and confirmed.

2/ This study presents climatologic results on stratopause and mesopause heights. There are some recent works about some cases with double stratopause, also close below the mesopause we observe sometime inversion layers and structures due to interferences with tides. Around the mesopause measurements can be noisy and is coincident with the Rayleigh and resonance transition. So the detection of such limits between two regions is a difficult issue. I will recommend that authors add some more information how they derive such quantities and how they resolve the methodologic issue associated with perturbed stratopause and noisy mesopause cases. Also some comments about the seasonal changes of the stratopause and the mesopause in relation with the climatology will help to see if these changes are consistent with temperature climatology or are specific features of this region.

3/ The statistical comparison of the lidar with this version of ECMWF reaching 70 km is quite new and interesting. Large differences seem to be observed at the stratopause levels (20 K). It will be interesting if authors can comment about the confidence of such differences and causes. Are they related to non-perfect time coincidences or mainly related to stratospheric warming events?

4/ The comparison with MSIS below 70 km is still valuable to evaluate MSIS and to have comparisons with previous works. It will be valuable to see if Kuhlungsborn lidar confirms the bias already reported.

5/ The presence of NLC in June can bias the temperature profiles, and mainly we can expect some sporadic layers that can be hard to detect but still could bias the temperature. While this possibility is mentioned it is not clear in the manuscript how this issue is handled.

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