

Interactive comment on “Local Stratopause Temperature Variabilities and their Embedding in the Global Context” by Ronald Eixmann et al.

Anonymous Referee #1

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This paper presents a study on the contribution of planetary waves (PWs) to the local stratopause temperature variability based. It is based on the use of global MERRA-2 analysis to estimate the contribution of PWs wavenumber 1, 2 and 3 at fixed locations where Rayleigh lidar observations are available, Andenes at polar latitude in Northern Norway and Kühlungsborn at middle altitude in Northern Germany. In the first part of the results section the authors compare the stratopause characteristics at these two locations retrieved from lidar observations and from MERRA-2 analysis. Two cases are considered, the overall wintertime stratopause climatology and the climatology of stratopause temperature enhancements (STEs). The rest of the paper is based only on the use of MERRA-2 data to estimate the contribution of PW wavenumbers 1, 2 and 3 to the local stratopause variability. Although I consider that this subject may be

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interesting, I don't think that this paper brings new interesting information because it does not address the subject the right way as explained below.

The main reason is that the estimation of the contribution of PW 1, 2 and 3 to the total stratopause temperature variability is made using only MERRA-2 data on not taking advantage of having more resolved local lidar profiles. The reanalysis smooth out the small-scale perturbations that can increase the variability, including local temperature perturbations induced by gravity waves breaking and PWs with high wave number. Furthermore there are very few observations assimilated in the model at the stratopause altitude and in the mesosphere. This is not surprising that most of the variability in the reanalysis comes from the PWs with lowest wavenumbers but this does not prove that it is the same in the reality. It shows only that MERRA-2 analysis captures mostly the contribution of larger scale PWs. It would have been much more interesting to use the MERRA-2 analysis to compute the PWs contribution to the stratopause temperature at lidar locations and to remove this contribution to stratopause temperature observed by the lidars. However this would imply that MERRA-2 reproduces faithfully the large scale temperature variability.

The comparison of the STE characteristics from lidar observations and MERRA-2 analysis made in sections 3.1 and 3.2 is also not convincing. I don't consider that the differences are small as it is claimed at line 8, page 6. For instance, at Andenes, there is a 7-km difference between the climatological stratopause altitude in MERRA-2 analysis (57 km) and in lidar observations (50 km). This is not at all a small difference. A careful comparison of average temperature profiles and stratopause characteristics should have been done. This is also a prerequisite to use MERRA-2 data for embedding the local observations in the global context.

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