Ann. Geophys. Discuss.,
https://doi.org/10.5194/angeo-2020-73-RC1, 2020

Annales Geophysicae Discussions

Interactive comment on "Stratospheric influence on MLT over mid-latitudes in winter by Fabry-Perot interferometer data" *by* Olga S. Zorkaltseva and Roman V. Vasilyev

Anonymous Referee #1

Received and published: 14 December 2020

This paper presents a study on the influence of the stratospheric circulation on the mesosphere-lower thermosphere (MLT) based on observation of oxygen airglow emission (green line) in Eastern Siberia. The atmospheric layers are strongly coupled in winter when planetary waves can propagate upwards from the troposphere up to the MLT in the prevailing westerly winds. Observational evidences of this coupling are very welcome to improve our understanding of the processes involved. The most spectacular dynamical phenomena occurring in the middle atmosphere are the sudden stratospheric warmings (SSWs) in winter. They are always preceded by an amplification of planetary waves (wave 1 and wave 2). One originality of this paper is to consider not only the influence of SSWs on the MLT but also the influence of stationary planetary

waves. This document provides new information on the subject, but some additions and corrections are necessary to make it acceptable for publication in Annales Geophysicae as listed below:

- I do not understand why the term "stationary planetary wave" is used. The amplitude of the planetary wave (PW) is computed from ERA5 data from the given day but we do not know if the PW is stationary or travelling. The information of the phase evolution is needed to distinguish between stationary waves (constant longitude of the maximum) and travelling waves (longitude of the maximum shifting with time). It would be more appropriate to use only the term "planetary wave" or to show that the longitude of the PW is more or less constant.

- Observations are made on a middle latitude site (47.6N). The influence of PW phase should be considered. The TOR is at a longitude often close to position of the PW. To interpret the results I recommend to indicate also the spatial structure of SPWs as it is made for SSW (lines 113-115 and Figure 4). Is it the same for all SPW events ?

- Line 145. Please Indicate why you consider the 2019-2020 SSWs are atypical.

- Page 16, section 3.2., first paragraph. A more detailed description of the results is needed in this paragraph. It is said that the low emission is always observed during the increased activity of SPW1. This is not the case in 2019-2020 as well as for the increase of temperature. The temperature increase during SSWs does not occur always in the same part of the SSW period, at the beginning for SSW1 in 2016-2017, at the end for SSW 2 in 2016-2017, in the middle for SSWs in 2017-2018 and 2018-2019 and outside of the period for SSW 1 and 2 in 2019-2020.

- Line 183. It would be more logical to inverse the sentence: "the stronger the wind inversion in the stratosphere, the stronger the wind inversion in the MLT".

- Figure 16. Please add the signification of the three panels in the figure legend, not only in the text.

- Line 227. What is the NNE ? It is not defined.

- Section 3.4, lines 229-230. The increase in temperature standard deviation during SSW events is attributed to the increase in MLT tide amplitude. However the cause of this increase is not discussed in this section. Also it is not clear if the sentence refers only to winter 2019-2020 or to all winters. Looking at Figure 18, it seems that it is true also for other winters. An explanation is given in the conclusion where the increase in tide amplitude is attributed to the increase in the altitude of the emission layer during the SSW. This interpretation should be also discussed in section 3.4.

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