

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-393

Anonymous Referee #1

Referee comment on "A new methodology for measuring traveling quasi-5-day oscillations during sudden stratospheric warming events based on satellite observations" by Zheng Ma et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-393-RC1>, 2022

The study focuses on the response of atmospheric quasi-5-day oscillations (Q5DOs) to sudden stratospheric warmings (SSW). Westward and eastward traveling Q5DOs with zonal wavenumber 1 and 2 have been previously reported to enhance during some SSW. However, it has been difficult to accurately estimate the amplitude of the traveling Q5DOs under the presence of quasi stationary planetary waves (SPWs) whose amplitude can also rapidly change during SSW. To overcome this issue, the authors introduced a new methodology to determine the amplitude of the traveling Q5DOs that avoids the contaminations from SPWs. The authors applied the new method not only to synthetic data but also to the geopotential height measurements from Aura/MLS during major SSW events in 2006-2021. It is demonstrated that the amplitude of the traveling Q5DOs could be overestimated or underestimated during SSW if the conventional method was used.

The paper is well written and logically structured. The new method is well explained. The validity of the new method is demonstrated using synthetic data, and the limitation of the method is appropriately addressed. The comparison of the traveling Q5DOs obtained from the new and conventional method highlights the importance of taking into account the variability of SPWs during SSW.

I recommend this paper for publication basically in the present form. The following are minor comments that I believe the authors could easily address before publication:

Figure 1
The label for the horizontal axis is missing.

line 180
"does" should be "is".

line 187 " $(A_k(t))$ "

One "(" should be removed.

line 235 "the original data $Y'(x,t)$ "

Y' is not the original data. Rather, it is a reconstruction of the original data without rapid changes of SPWs.

line 291 "The fitting result is marked at the end day of each 20-day window."

This information should be provided when the 20-day window was first mentioned (line 142), because the information is needed in order to understand the timing of amplitude changes depicted in Figure 1.

Figure 6

It should be mentioned in the figure caption that these are composite results obtained from 8 major SSWs. Also, it would be informative if the authors could indicate either in the figure caption or in the figure itself that these results represent "new" minus "original", not the other way around.