

## **Response to the comments by Anonymous referee #1**

*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:*

### **Response:**

We thank the referee for his/her thoughtful and constructive comments. We

modified the manuscript completely following his/her suggestions. Please find the point-to-point responses below. We are grateful for the referee's recommendation.

**Minor Comments:**

***1. Figure 1 The label for the horizontal axis is missing.***

Response:

In the revised Figure 1, we added the label for the horizontal axis.

***2. line 180 "does" should be "is".***

Response:

We made the change.

***3. line 187 " $((Ak(t))$ " One "(" should be removed.***

Response:

We made the change.

***4. 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.***

Response:

In the revised manuscript, we replaced the "original data" with "the reconstruction of the original data" as your suggestions.

*5. 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.*

Response:

We added this information on line 145 as your suggestions.

*6. 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.*

Response:

Thank you for your suggestion. We removed the composite results in the previous Figure 6 in the revised manuscript. In the revised Figures 6-9, we also marked "new minus original" in figure titles.