

Response to the 2nd referee's comments on "Mesospheric semidiurnal tides and near-12-hour waves through jointly analyzing five longitudinally-distributed specular meteor radars at boreal midlatitudes" by Maosheng He and Jorge L. Chau

Maosheng He¹ and Jorge L. Chau¹

¹Leibniz-Institute of Atmospheric Physics at the Rostock University, Kühlungsborn, Germany

This paper is innovative in the way that it uses longitudinally-distributed ground-based wind observations to get high temporal resolution and adequate spatial resolution to identify the sidebands (USB, LSB) of the Q16DW-SW2 interaction as distinct from M2, SW1, and SW3. The conclusion that previous space-based studies may have attributed USB and LSB to SW1 and SW2 and sometimes M2 is a very important and illuminating result.

5 In all, the paper is very well presented with new perspectives provided by the analysis and choice figures.

The interpretations in terms of polar vortex weakening and polar vortex classification during SSWs is also a very interesting and an important contribution. However, I wonder why correlations between USB, LSB, SW1 and SW3 with SPW and Q16DW are not reported, since the former set of waves is more directly/physically connected with SPW and Q16DW, rather than whether there is an SSW or not. It raises the questions: What is the connection between Q16DW and SSWs? Perhaps in the
10 text you could explain why relationships with sPW and Q16DW are not reported, but SSW characteristics are used instead.

Response: a paragraph is added to Section 4, immediately before the title of Section 4.1, to discuss the triple association among Q16DW, SW2 and the secondary wave and the association between Q16DW and SSWs.

We have not discussed sPW and Q16DW in details mainly because the current work is observation-orientated. The current manuscript is organized largely as following,

- 15 (1) propose a new approach;
(2) describe the results, either consistent or inconsistent with previous results;
(3) discuss the potential explanations.

In describing the results, we note that the 11.6hr and 12.4hr oscillations often enhanced after SSWs (cf., Figure 3 in the manuscript). Therefore, to investigate the association with SSWs is intuitive and straightforward for us. Besides, there are two
20 other reasons that motivate us to explore the SSW association. The first is that during SSWs reported were enhancements of five near-12hr waves, namely, SW1, SW3, M2, the LSB, and USB. The other is that SSWs provide a good epoch reference.

Physically, the association of the parent waves and secondary waves should definitely be explored in a future effort.

In the added paragraph, we refer some studies reporting the triple association among Q16DW, SW2 and the secondary wave and the association between Q16DW and SSWs. These works used single radar approaches. We are also preparing an
25 independent manuscript investigating the association between PWs and SSW through multi-radar approaches.

For a split vortex, do S0 and SW4 replace SW1, SW3?

Response: After vortex splitting, sPW-2 amplifies. If sPW interacts with SW2, S0 and SW4 would be generated according to the resonance conditions. However, instead of supporting the sPW-SW2 interaction, the current manuscript reports evidence supporting the traveling Q16DW-SW2 interaction. Namely, the potential secondary waves of sPW1-SW2 do not enhance
30 during SSWs, instead, those of Q16DW-SW2 interaction does.

When comparing with CTMT, perhaps it would be beneficial to form 2-monthly means of the ground-based data so the comparison is more consistent?

Response: we share the point that to compare results at the same resolution is fairer than what we showed. Here, in Figure 1, we display the suggested comparison. The correlation coefficients of all components are higher than those displayed in the

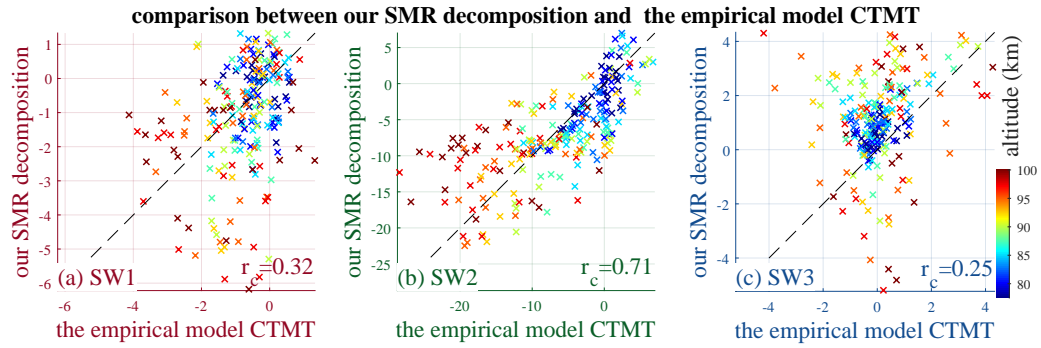


Figure 1. Same plot as Figure 8 in the manuscript but using the SMR results after being averaged in a 2-month-wide sliding window

original Figure 8, by up to 0.01. This situation is discussed at the end of revised Section 5.2. We hesitate to replace Figures 7 and 8 with their smeared version because our main purpose here is to emphasize the difference rather than the consistency.

Specific comments

Page6,line 23: consistency

5 **Response:** revised.