Response to editor

Editor comment:

The authors have addressed the scientific issues identified by the reviewers. The paper is suitable for publication in ACP once the minor revisions identified by referee 1 have been addressed and careful examination and revision of the paper has been undertaken by the authors to ensure the writing is clear and wording correct. Some of these issues have been identified by the reviewer. The authors should make sure that there are no other issues of a similar character remaining in the paper.

Response: Thanks for your suggestion. We have revised the whole manuscript to improve the English. And the minor revisions identified by referee 1 have been addressed.

Response to reviewers

Reviewer #1 (Suggestions for revision):

1. They have done a comprehensive revision in order to address my concerns. Lines 248-253 are a good example of how their results expand upon Vitharana. The problem is that many of the revisions are written in poor English causing confusion (as least to me) in their explanation and rendering it frustrating to read. There are fluent English speakers listed as co-authors; they should engage them with my questions below.

Three main concerns are followed by minor grammatical comments:

1) Regarding the new title- what exactly is "anomalous"? The word means "deviating

from normal". It implies something unusual about the tides during El Nino, and it's not clear to me what that is. Do they mean "Reduced"? Or "Suppressed"? They use this word again only once, on line 456 and I don't understand it. (and grammatically to say "positive anomalous" is poor English). I recommend deleting this word from the title.

Response: Thanks for your suggestion. It has been removed in the title and line 456 of the revised manuscript.

2) A question was why do they use WACCM4 not 6. They have some discussion of that around line 163 where they say "opponent response"….
What does this mean? Its poor English. If it means "opposite", then still, they should explain this in more detail because its important.

Response: It has been revised in line 163 according to your suggestion. As added in lines 100-105 in the revised manuscript as, "Based on the WACCM version 6 simulations in which the QBO and ENSO are self-generated, Ramesh et al. (2020) investigated the linear response of latitude-pressure variation of DW1-T to the seven predictors including ENSO in four seasons by adopting the Multivariate linear regression. During the NH winter, as suggested by Figure 5 in Ramesh et al. (2020), the linear response of DW1 T amplitude to ENSO is significantly positive in the tropical MLT region." This positive response of DW1 tide to ENSO is opposite to what is suggested by SABER observation (significant negative response of DW1 to ENSO during the NH winter). Therefore, the SD-WACCM4 model simulation in which the DW1-ENSO relationship is consistent with the observations was used to study the mechanism.

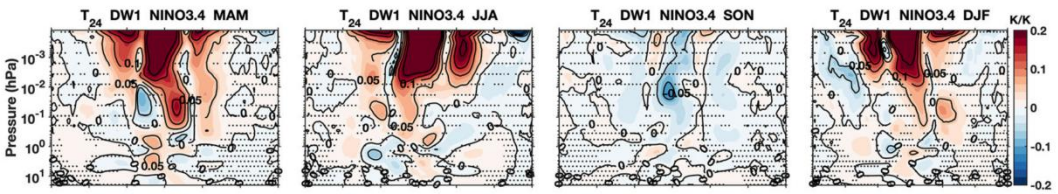

Figure R1 (Figure 5 in Ramesh et al., 2020): The seasonal variation of the latitude-pressure distribution of ΔT24 responses to Niño3 averaged for three WACCM6 realizations. The responses in stippled regions are not significant at the 95% confidence level ($p > 0.05$). Contour intervals = 0.05 K/K (The fourth row of figure 5 in Remash et al., 2020).

3) Third is all the GW discussion:

Line 397 What is "DW1 zonal GW drag"? It's a string of words that individually might be OK, but in a string like that- do not make sense.

Response: According to your suggestion, it has been revised as "the DW1 amplitude of the zonal component of GW drag (DW1 GW drag hereafter)" in line 397.

Line 399: what is "zonal wind DW1 tidal"? The word "tidal" is an adjective- it needs to modify a noun after it. What's the noun? Do they mean "tide"? That is a noun. Thus, "the DW1 tide" is proper English. "the DW1 tidal" is not.

Response: It has been revised in line 399 according to your suggestion.

I still think the effects of GW forcing need more explanation. It seems to me that you would need to show the phase of the GW drag. I understand how the wind tendency could be 6 hours out of phase with the wind, but without seeing the drag variation, it seems to me to be an incomplete argument. It does not help that Figure 8 is confusing:

Response: Thanks for your suggestion. To illustrate the effect of DW1 GW drag on the DW1 wind, Figure R2a shows the DJF mean phase of DW1 GW drag during DJF of 1979-2014 while Figure R2b shows the DJF mean time tendency of the phase of DW1 zonal wind. In the tropical upper mesosphere (above 80 km), the phase of DW1 GW drag (greater than 12 hours) is quite different from the phase of the time tendency of DW1 zonal wind (less than 12 hours). As a result, the DW1 GW drag tends to dampen DW1 zonal wind due to their phase difference (greater than 6 hours) in the tropical region (Figures R2c and R2d). In the subtropical upper mesosphere (10° S - 40° S, 10° N - 40° N, 80-100 km), the phase of DW1 GW drag is close to the phase of the time tendency of DW1 zonal wind. Thus, the DW1 GW drag tends to force DW1 zonal wind due to their the phase difference (less than 6 hours) in the subtropical region.

The phase of the DW1 component of GW drag and zonal wind and the related discussion have been added to the supporting information.

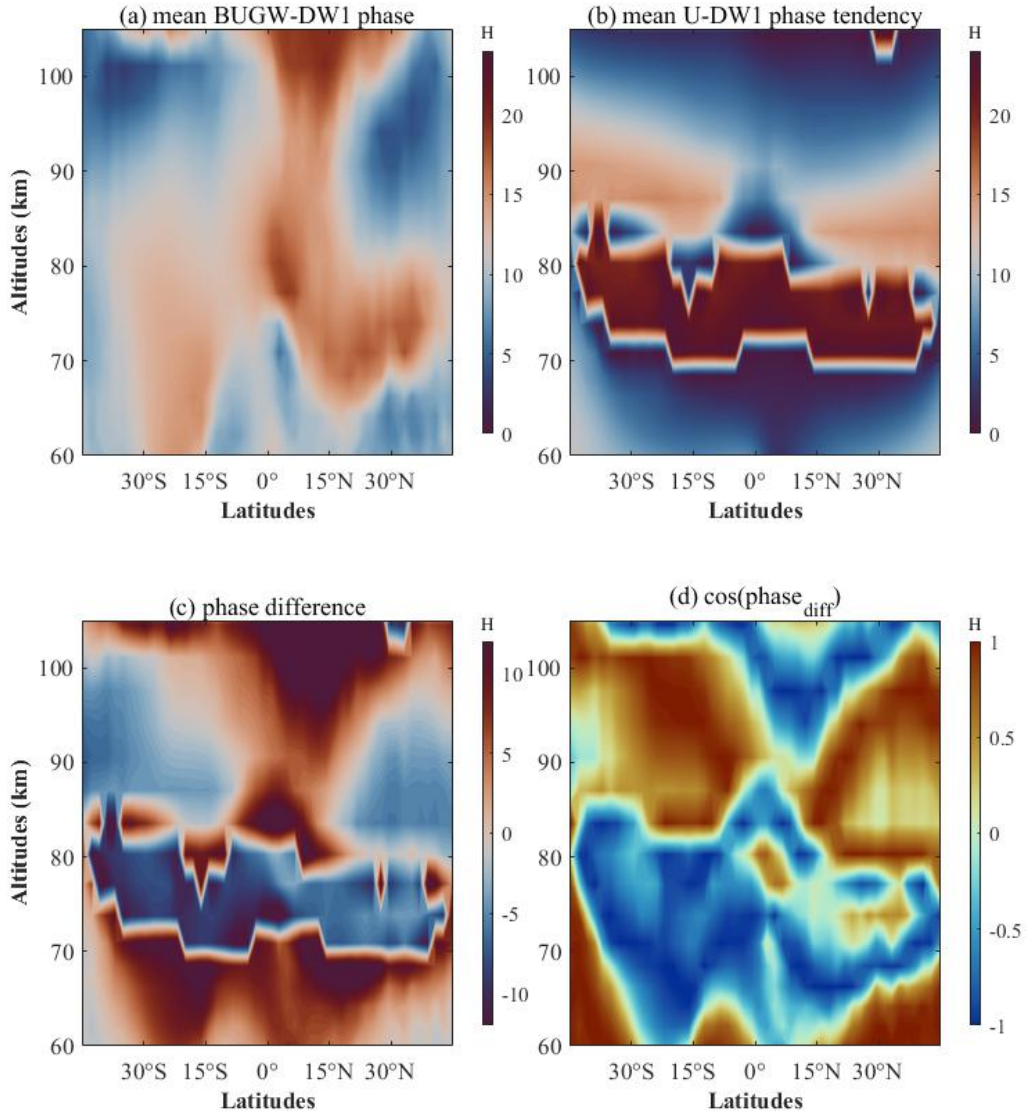

Figure R2 (Figure S7 in the revised supplement). (a) Mean Gravity Wave (GW) drag due to convection on the phase of DW1 tidal U during the winter (DJF). (b) The mean time tendency of the zonal wind DW1 tidal phase during the winter (DJF). (c) The phase difference between (a) and (b). (d) cos value of phase difference.

Again, it might be English. Its also the near-complete absence of a functional figure caption. First, in line 420, they say significance "below 95%"?? don't they mean "above 95%"? Then, in the figure, the gray areas are the low correlation. I would like to see which correlation coefficients are significant. What's the red shading and what is the blue shading? What are the dashed lines and what are the solid lines?

Response: In line 420, “the grey areas indicate statistical significance below 95% level” has been revised as “The red areas indicates statistical significance above 95% level of the F-test”. Descriptions of shading and lines have been added in the figure captions as “Solid lines and red shadings denote the positive responses, while dashed lines and blue shadings denote the negative responses; the grey regions indicate where the response is insignificant at the 95% level according to the F test.”.

4) Then, finally, below are examples of poor grammar. They are not all-inclusive, just a sampling.

They mix up Liberman with Lieberman, the 2007 reference. The latter is correct.

Response: Thanks for your suggestion; it has been corrected.

Line 88: remove “that”

Response: corrected.

Line 115: Its either just “TIMED”, or “The TIMED satellite”, but not “the TIMED”

Response: It has been revised as “The TIMED satellite.”

Lines 123 and 131: SABER is not a noun. If they want to use “the” it needs to be “The SABER experiment”

Response: “the” has been deleted.

Line 402: “the zonal wind”

Response: corrected.

Line 404: “The phase of the DW1 tide time trend leads the tide itself”….. What does this mean? Or was “trend” supposed to be “tendency”??

Response: Thanks for your comments; the word “trend” has been revised as “tendency.”

Line 409: Do they mean “forcing of the DW1 tide”?

Response: Yes, it should be “forcing of the DW1 tide”. We have revised as your suggestion in the manuscript.

Line 417: “subtropical” is an adjective. They mean “subtropics” or “subtropical

latitudes”

Response: corrected.

Line 420: I assume they mean “clearly modulating”

Response: corrected.

Line 437: “reaches”

Response: corrected.

Line 471: I don’t think they mean “sophistic”. That word is related to "sophistry" and means “unsound or tending to mislead”. Perhaps they mean “sophisticated”. Quite the opposite.

Response: corrected.

Line 485: “needed”

Response: corrected.

Response: Thanks for your suggestion. The manuscript has been revised according to your request. We have carefully edited the manuscript to improve the English writing.