

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-884

Anonymous Referee #3

Referee comment on "Suppressed migrating diurnal tides in the mesosphere and lower thermosphere region during El Niño in northern winter and its possible mechanism" by Yetao Cen et al., Atmos. Chem. Phys. Discuss.,
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I agree with the first reviewer that this paper should compare with Vitharana et al. (2021), where the negative correlation between DW1 and ENSO is clearly established, Vitharana also used SABER data. The significance of this paper lies in the physical mechanisms. I am surprised to see all three sources (tropospheric heating, wind filtering and gravity waves) are pulling in the same direction, making DW1 amplitude smaller in the El Nino phase.

For tropospheric heating, the Hough mode analysis is well done. The tropospheric heating however presents positive and negative correlations with DW1 amplitude at different heights and latitudes. The authors averaged the heating between 0-16 km and 35 N and 35 S and found there is an overall decreasing heating rate during El Nino. How do you justify the choice of the altitude and latitude range? Apparently, if you calculate the correlation with a different range, you can get a totally different conclusion.

Similar scenario happened to R, the range is chosen between 15 and 35 degrees in each hemisphere, how is this range chosen? does the conclusion change if a different range is chosen? R is positive and negative several times below the MLT, how does that affect DW1 propagation?

I also agree with reviewer 1 that the third mechanism about gravity wave drag needs further investigation. I don't understand why the correlation between gravity wave drag and DW1 is negligible or even negative while the correlation between gravity wave forcing and DW1 is positive in the MLT region at all latitudes.

Overall, I think the attempt by the authors to study the physical mechanisms is a good one, but more thorough presentation and work is needed in order to convince the readers.

