Comments on the paper “Research on 16-day Planetary Waves in the Mid-latitude Troposphere, Stratosphere, Mesosphere, and Lower Thermosphere with Langfang Dual-frequency ST-M Radar Data” by
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The paper presents new data about the wind variability in the MLT and in the troposphere/lower stratosphere, as well as some results on the coupling between these atmospheric layers. The methods used in the analysis are not well justified and are sometimes incorrect. Therefore the paper needs a major revision. The detail comments are given below.

The title does not clearly describe the article. The radar data cover the lower stratosphere and the MERRA data are not mentioned.

Data Sources and Analysis Methods

1. Extracting Daily Mean Wind:
Why do the authors use the criterion of 10 hours? What are the errors of the daily wind speeds obtained with the method proposed by the authors?
2. Detrending
The MLT winds are characterized by the strong seasonal course and strong changes in spring, sometime in autumn and during SSW (for example, in January 2024). The wind behavior model with a simple linear trend is not correct for these cases. Therefore, the 16-day wave parameters may be obtained with large errors or may be completely incorrect. I recommend removing the seasonal course first.
3. Spectral analysis
The time series of the zonal and meridional wind speeds have large gaps from month 3 to month 5 (figure 1). On the one hand, such gaps may easily distort the spectrum obtained with the Lomb-Scargle method. On the other hand, the authors fill in the gaps for their further analysis.
I recommend removing the data with these large gaps.

Figure 3. Please, indicate units of the color levels. What level is significant?

3.3 Spatiotemporal variations of the 16-day period planetary wave
L.325-330 “No significant planetary wave activity is observed in the MLT during summer…”
How do the authors separate significant and non-significant wave activity?

Ln. 350-365 Please, indicate errors of the vertical wavelength you found.

Ln.367-376 It is very important for the analysis provided in this part and below that the errors of the phase speeds are small enough to draw any conclusion.

Ln.380 $Q_y < 0$ is not sufficient for the instability.

Ln.380-383 The authors use the result of the quasi-geostrophic theory. The conclusion from eq.3 is not correct. The vertical phase speed is opposite to the vertical group speed in the coordinate system that moves with the zonal flow ($Qy > 0$). If one takes into account the background zonal flow U_0, then the result will be complex and will depend on U_0.
By the way, the authors should explain the notation in the equation and provide a reference.

L.385 “Fig.5. Assuming that the frequency-wavenumber spectrum in the MLT is consistent with that at the 79 km altitude, the dominant wavenumber for each time was selected as the wavenumber for that period. “
Why are the spectra consistent? The MERRA-2 data are given at the model level, but the MR winds are given at altitudes. The difference between the true heights may be significant.
There is no confidence that oscillations presented in Fig.5 are statistically significant.

3.4 Propagation characteristics of the 16-day period planetary wave

The aim of this part is “To investigate the location of the wave source in the ST” and “the relationship between the planetary waves in the two regions”.
The analysis is confined in latitude and longitude to the region where the radar is located. Therefore, the authors (and the readers) do not know how 16-day waves propagate in the neighboring region. Hence, the authors can’t really reach their aim.
Additional note, the real atmospheric 16-day waves are transient, their amplitudes are changing with time as observed. The theory used in this part does not work for such waves.
I propose to find and plot the E-P flux for the waves.

Conclusion

Ln.465 “The quasi-16-day and quasi-10-day waves dominate in both the ST and MLT regions” – this conclusion may be a result of the 32-day segment used for the analysis and a linear trend model. The waves with shorter periods are just averaged over the segment and their transient behavior is not taken into account.
Conclusions (2) and (3) repeat the first one. The errors of phase speeds are not clear. Therefore, the statements about their changes are not supported in the text.
Ln.475-479 Please, see above. The authors’ statements are incorrect.
Ln. 480 Conclusion (4). This conclusion does not have a solid support from the analysis as it is noted above. The sign of speeds, the wavenumber estimations are in question.