

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-981

Anonymous Referee #2

Referee comment on "Radar observations of winds, waves and tides in the mesosphere and lower thermosphere over South Georgia island (54°S, 36°W) and comparison with WACCM simulations" by Neil P. Hindley et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-981-RC2>, 2022

The paper presents results of meteor radar measurements of mesosphere/lower thermosphere (MLT) winds and waves at a remote site at South Georgia island. The MLT is a crucial region of the atmosphere, with wave-mean flow interaction as a major mechanism that drives the background circulation. Detailed high-resolution continuous observations especially in the Southern Hemisphere are therefore very useful for understanding atmospheric dynamics and validating numerical models.

The paper begins with the radar description and the presentation of a new method of data analysis, which may allow to extend the vertical range of measurements. Results for mean winds, tides, planetary waves and gravity waves are shown. The paper also includes a comparison of the results with WACCM circulation model predictions, indicating some differences and also partly known issues with numerical modeling of MLT dynamics

The paper is well written, the presentation is clear and the conclusions are well supported by the observations. I recommend publication after considering some minor comments below:

The radar is sometimes referred to as "South Georgia radar" and as "KEP radar", which is a bit confusing

L 76-83: please add peak power

Figures 2 and 4: daily data gaps above 100 km seem to match the poleward maximum of the meridional wind. Could this lead to an equatorward bias? There are rather strong

equatorward meridional winds in summer at that height region as shown in Fig 4. But there is some contradicting evidence for poleward meridional winds above 100 km (e.g. Qian et al., 2017). Could you please comment on that?

Section 3.2: Is there a regular bias between the two methods at the heights where both of them provide data? Maybe you can add a figure in the supplement.

Figure 3: The S4 peak is rather well visible. I would be interested if there is a seasonal cycle in 6hr tidal activity, even if the amplitudes amount to just a few m/s.

Figure 3, l 202: could you add a -5/3 line to the figure? It looks like there is a slight change of the slope at about 4 hrs.

L 214: 54° is frequently called "higher midlatitudes" rather than high latitudes, e.g. in Stober et al. 2021.

Figure 4: The summer meridional wind maximum is lower than the one seen at Tierra del Fuego in Stober et al. 2021b. Is there an explanation?

L 265: terdiurnal □ terdiurnal

L 335: 10 ms □ 10 ms⁻¹

L 472: delete "that" after "limitations"

L 945; reference should read "Solomon, S., and R.R. Garcia"

Ref: Qian, L., Burns, A. & Yue, J. (2017). Evidence of the lower thermospheric winter-to-summer circulation from SABER CO₂ observations. *Geophysical Research Letters*, 44, 10,100– 10,107. <https://doi.org/10.1002/2017GL075643>

