

The authors present long-term analyses of mean winds, tides, and PW and GW proxies obtained from meteor radar observations at three sites at middle and high latitudes since 2002. They apply a new method to derive the tides. Long-term changes (linear trends) are also presented, and a brief analysis of possible solar cycle effects on the winds.

The results are certainly interesting and worth to be published. However, description and presentation are partly unclear, and some revision is necessary. Specific comments are given below.

page 2, l 14-20: In the presentation, stationary and traveling PWs are confused. Land-sea differences mainly force SPW, but traveling PW can be formed by other mechanisms. Energy transport is mainly due to breaking waves. And of course SPW cannot be seen by single radars.

Page 3, l 14-15: "To estimate the PWs..." This sentence is rather confusing here. GW are calculated as residuals from the tidal fit (during one day?). Please state this clearly. PW are described later, remove this here.

Page 3: l 18-25: This paragraph comes somewhat unmotivated here. It should be moved up, e.g. before the discussion of Figure 1.

Page 5, l 19: did you apply a fit with 12 and 24 hrs, or with 3 components according to Eq. 1 and just did not show the terdiurnal component? Please clarify.

Page 6. l 14-16: This is unclear to me. Phase delay can be analyzed with lagged correlation, and I also do not see why a 11-year fit provides more physical insight than a regression.

Page 7, l 1: Gaussian error distribution. The degree of freedom decreased if there is an autocorrelation, and this should be the case e.g. through the solar cycle. Please comment on this.

Page 8, l 5, Figure 5: The presentation of significance levels is unclear. There are frequent trend changes from positive to negative, and therefore zero trends, which are nevertheless indicated as significant. So what is the test hypothesis?

Section 4.1, 1st paragraph: it may be worth to note that the seasonal cycle of the DT differs from the one presented in earlier papers like Portnyagin et al., 2004 or Jacobi 2012 in particular at lower heights, e.g., there is no or only weak spring/autumn enhancement. Earlier papers frequently used longer time windows for analysis. Differences then may be explained by strong day-to-day phase changes especially during summer. I would be interested in knowing whether this is the case.

Page 9, l 31, see also discussion and conclusion. Circular polarization means that u and v have the same amplitude and 90° phase difference. The latter is not shown.

Page 10, l 10. SSW are connected with mean wind changes at the time scale of days or few weeks, i.e. in the period range of PWs. So how do you distinguish between them? This also questions your statement on lines 11/12 that PWs are less strong during minor warmings.

Section 5: Earlier papers have shown that a possible solar cycle effect can be in phase, out of phase, or lagged with respect to the solar cycle. So here the phase should be provided to be able to compare with literature results.

Minor issues

Abstract, l 17: it is more common to handle the zonal and meridional wind components separately: ... the south and to the west.

Abstract l 10: The influence of the 11-year solar cycle on the winds and tides is presented. Please provide the main result here.

Page 2, l 27: with the exception of... do you mean „according to“ ?

Page 2, l 34: wavesrestoring → wave's restoring

Page 3, l 12: I assume that $T_3 = 8$ hrs, please add this information

Page 3, l 13: PW → GW

Page 3, l 16: nearly two weeks → ten days

Page 3, l 28: Stober et al. 2012 does not deal with LTC

Page 4, l 2: Portnyagin et al., 2004 did not investigate LTC, but shows a long-term climatology

Page 4, l 3: Lukianova et al., 2018 did not investigate LTC, but interannual variability, in particular SSW

Page 4, l 5: meridional wind trends by Jacobi et al., 2015 differ between seasons after 2005

Page 5, l 27: benefit is → benefit of

Page 6, l 4: seasonal → annual

Page 7, l 25: Jacobi et al. 2015 only showed data at ~90 km, do you mean Jacobi, 2012?

Page 7, l 35: 2006 → 2007

Page 8, 2nd paragraph: The description is confusing. Please state clearly to which month and which altitude you refer to.

Figure 12: again, there are zonal trends indicated as significant.

Reference Portnyagin et al., 2004: provide doi: <https://doi.org/10.5194/angeo-22-3395-2004>