General comments on MS No: **acp-2017-1150-version3** "*Long-term observation of mid-latitude quasi 2-day waves by a water vapor radiometer*" by Martin Lainer, Klemens Hocke, and Niklaus Kämpfer

I am not satisfied by both the response to my comments and the revised version of this paper. As a consequence my general concerns remain the same as before, i.e. **this study suffers from the lack of new scientific results; actually the paper presents only observations of quasi-2-day oscillations, nothing more.**

In order to clarify why I am not satisfied by the response to my comments I am going to comment the authors' response. For convenience, their response is copied here in italics.

1. *Ground-based observations of quasi 2-day waves are rare and there are no studies on Q2DWs from ground over such a long period of 7 years. The MIAWARA observations rank among the longest records of microwave radiometric H2O measurements in the strato- and mesosphere from ground. We think that satellite data can be problematic for these short term variabilities due to long reoccurrence times over the same location. To investigate non-linear interactions to tides on a single event basis is not possible with e.g. Aura MLS data.*

Hardly could agree that ground-based observations of the quasi-2-day waves are rare; please, note that the first report about these waves was presented by Müller in 1972 using meteor radar observations. Later numerous papers based on D1 radio wind measurements, MF and meteor radars, OH temperature measurements, lidars, etc. have been published. Moreover particular multi-instrument observational campaigns were organized for studying the MLT dynamics, including the quasi-2-day waves as well. I cannot agree also that there are not studies based on ground-based measurements with such a long period of 7 years. Please, see below some papers presenting longer than 7 years measurements:

Harris, T. J. (1994), A long-term study of the quasi-two-day wave in the middle atmosphere, J. Atmos. Terr. Phys., 56, 569–579, doi:10.1016/0021-9169(94)90098-1 (**12** years of MF radar measurements 1980-1991)

Lilienthal, F. and Ch. Jacobi (2015), Meteor radar quasi 2-day wave observations over 10 years at Collm (51.3° N, 13.0° E), *Atm. Chem Phys.*, 15, 9917-9927(11), doi:10.5194/acp-15-9917-2015 (**10** years of meteor radar measurements 2004-2013)

Rao, N. V., V. R. Madineni, C. Vedavathi, T. Tsuda, et al. (2016), Seasonal, inter-annual and solar cycle variability of the quasi two day wave in the low-latitude mesosphere and lower thermosphere. *J. Atmos. Sol.-Terr. Phys.*, 152, doi:10.1016/j.jastp.2016.11.005 (**17** years of MF radar 1993-2009 and **10** years of meteor radar measurements 2005-2014)

Offermann, D., P. Hoffmann, P. Knieling, R. Koppmann, J. Oberheide, D. M. Riggin, V. M. Tunbridge, and W. Steinbrecht (2011), Quasi 2 day waves in the summer mesosphere: Triple structure of amplitudes and long-term development, *J. Geophys. Res.*, 116, D00P02, doi:10.1029/2010JD015051 (**15** years OH temperature measurements 1988-1993)

Jacobi, Ch., P. Hoffmann, and D. Kürschner (2008), Trends in MLT region winds and planetary waves, Collm (52°N, 15° E), *Ann. Geophys.*, 26, 1221–1232 (**26** years of D1 radio wind measurements, 1980-2005)

I agree that the satellite studies of planetary waves can be complicated by aliasing but recently Pancheva et al. (2018), investigating the long-term variability of the quasi 2-day waves observed by MLS/Aura, first presented a detailed comparison between the altitude structures of all (eastward and westward travelling) QTDWs extracted from both the synoptic NOGAPS-ALPHA data and the asynoptic MLS/Aura ones to determine the aliasing. Hence that satellite data can be used quite successfully for studying planetary waves.

Sorry, I have never mentioned that the MLS/Aura data can be used for investigating the non-linear interaction between the tides and planetary waves; Aura is sun synchronized satellite and the tides cannot be determined at all.

2. *We agree that with our H2O profile data it is not possible to study detailed structures or wave characteristics (e.g. phases, wavenumbers). Due to the low vertical resolution of MIAWARA, which is in the order of 10 km, it is also difficult to detect vertical wave structures.*

You have single station measurements (i.e. the longitude and latitude structures of the wave cannot be defined) with low vertical resolution that does not allow the vertical wave structure to be determined. As a consequence I mentioned that **the paper presents only observations of quasi-2-day oscillations, nothing more.**

3. *The reviewer stated that there are many papers showing nonlinear coupling between the quasi 2-day wave, diurnal tide and quasi 18-hour oscillation. We are aware of some numerical investigations about this (e.g. McCormack et al., 2010; Lieberman et al., 2017) and a few papers on meteor radar observations (e.g. Huang et al., 2013a). We would appreciate if the referee could point us to the many papers we are missing. With our measurements we showed that these interactions can be determined also by the use of water vapor data.*

Please, see below only part of the papers based on ground-based measurements where the non-linear interaction between tides and quasi-2-day wave is studied. If in the title is mentioned ‘planetary waves’ this means that besides the ~2-day wave other PW waves are considered as well.

Clark, C. C., and J. S. Bergin (1997), Bispectral analysis of mesosphere winds, *J. Atmos. Terr. Phys*., 59, 629– 639

Kamalabadi, F., J. Forbes, N. Makarov, and Y. Portnyagin (1997), Evidence for nonlinear coupling of planetary waves and tides in the Antarctic mesopause, *J. Geophys. Res.*, 102(D4), 4437– 4446

Beard, G.A., Mitchell, N.J., Williams, P.J.S., Kunitake, M., (1999), Non-linear interactions between tides and planetary waves resulting in periodic tidal variability. *J. Atmos. Sol.-Terr. Phys*., 61, 363–376.

Jacobi, Ch., (1999), Non-linear interaction of planetary waves and the semidiurnal tide as seen from midlatitude mesopause region winds measured at Collm, Germany. *Meteorology Zeitschrift* , 8, 28–35.

Pancheva D. (2001), Non-linear interaction of tides and planetary waves in the mesosphere and lower thermosphere: observations over Europe, *Phys. Chem. Earth (Part C)*, v.26, 6, pp. 411-418.

Gurubaran, S., S. Sridharan, T.K. Ramkumar and R. Rajaran (2001), The mesospheric quasi-2-day wave over Tirunelveli (8.7N), *J. Atmos, Sol.-Terr. Phys.*, 10, 975-985, doi: 10.1016/S1364-6826(01)00016-5.

Pancheva, D. (2006), Quasi-2-day wave and tidal variability observed over Ascension Island during January/February 2003, *J. Atmos. Sol.-Terr. Phys.*, 68, 390-407.

Kumar, K. K., V. Deepa, M. Antonita, and G. Ramkumar (2008), Meteor radar observations of short-term tidal variabilities in the low-latitude mesosphere-lower thermosphere: Evidence for nonlinear wave-wave interactions, *J. Geophys. Res.*, 113, D16108, doi:10.1029/2007JD009610.

Suresh Babu, V., K. Kishore Kumar, S. R. John, K. V. Subrahmanyam, and G. Ramkumar (2011), Meteor radar observations of short-term variability of quasi 2 day waves and their interaction with tides and planetary waves in the mesosphere–lower thermosphere region over Thumba (8.5°N, 77°E), *J. Geophys. Res.*, 116, D16121, doi:10.1029/2010JD015390

De Oliveira Alves, E., L. M. Lima et al. (2013), Non-linear interaction between diurnal todal and 2-day wave in the meteor winds observed at Cachoeira Paulista and São João do Carrir, Brazil: A case study, *Rev. Bras. Geofisica*, 31(3), 403-412.

Guharay, A. and P.P. Batista, B.R. Clemesha, (2015), On the variability of the diurnal tide and coupling with planetary waves in the MLT over Cachoeira Paulista (22.7°S, 45°W), *J. Atmos. Sol.-Terr. Phys.*, 133, 7-17, doi: 10.1016/j.jastp.2015.07.016

Finally, I would like to clarify that the sum secondary wave generated by the non-linear coupling between the quasi-2-day wave and the diurnal tide should be **~16-hour wave**; the 18-h wave can be generated between the ~3-day wave and the diurnal tide.