Response to reviewer #2

We thank the reviewer for the useful suggestions that helped to significantly improve the paper. We have modified the manuscript following most of the suggestions. Specific response to the respective comments is given below, while the referee´s comments are repeated in italics.

I have however two concerns about the manuscript as it is currently presented to the reader.

1) There is a large number of errors and language mistakes that distract the reader from following the presented ideas. At times the meaning the authors attept to convey is completely lost. The authors need to carefully improve the writing of this manuscript. I attempted to indicate below as much as I can some possible improvements below.
– Thank you very much for all your hints, most of them are carefully improved.

2) Although the authors cite some previous work relating to QTDWs this needs to be significantly expanded. The connection to other works and how the research presented here relates to that and improves on it needs to be expanded throughout the paper.
– We extended the discussion, in particular more extensively referring to literature: Harris (1994), Chshyolkova et al. (2005), Baumgaertner et al. (2008), GU et al. (2013), Lima et al. (2012), McCormack et al. (2009)

<u>Page 9132</u>
Line9: *remove "on" before "average"* – We removed "an" (l. 7)
Line 12: *change "relation" to "relationship"* – Thank you, corrected. (l. 10)
Line 20: *remove "of a duration"*- Thank you, removed. (l. 18)
Line 23: *change ground based" to "ground-based"* – Thank you, corrected. (l. 20)

<u>Page 9133</u>
Line 24: c*hange "2 and 3 or 4" to "2, 3 and 4"* – Thank you, changed. (l. 43)

<u>Page 9134</u>
Line 8: *add "these gaps are" before "especially"* – We included a stop after "hours" and started a new sentence, including the referee´s suggestion. (l. 55)
Line 12-13: *the sentence "Therefore, here the MR winds are analyzed and can be used to evaluate the earlier results" needs expanding to explain why the use of MR winds is a superior choice and why it is different from what is previously used* – Thank you for your hint. We added another sentence: "[...] because meteor winds are observed continuously throughout the day. Possible MR data gaps owing to small meteor count rates especially at the uppermost and lowermost heights are shorter and more regularly distributed than the LF data gaps." (ll. 59-62)
Line 15: *add "is" before "based"* – Thank you, corrected. (l. 63)
Line 16: *replace "the true" with "actual"* – Thank you, corrected. (l. 65)
Line 17: *replace "their" with what it refers to, Jacobi (2014)* – Done (ll. 65-66)
Line 18: *replace "provided" with "obtained". Please add what makes obtaining further information possible* – Thank you, corrected. Another sentence is added as further explanation: " Compared with Jacobi et al. (1997), further information about the mid-latitude QTDW can be obtained with greater accuracy than the earlier LF measurements, in particular because the amplitude and phase uncertainties due to daytime data gaps of LF measurements will be avoided. " (ll. 67-69)
Line 22: *what does "SKiYMET" stand for ?* – The beginning of the sentence is modified: " A commercial VHF MR, distributed under the brand name SKiYMET (All-Sky Interferometric Meteor Radar, Hocking et al., 2001) is [...]". (ll. 72-73)

Page 9635
Line 9: *change "analyse" to "analyze"* – Thank you, corrected. (l. 86)
Line 10: *why do you refer to heights as "gates" ?* – This notation is frequently used in publications presenting radar data (e.g. Pancheva, 2006, JASTP; Younger et al., 2002, JGR ; Stober et al., 2008, ASR). To make the sentence more clear we inserted altitude ranges for each gate: "82 km (80.5-83.5 km), 85 km (83.5-86.5 km), 88 km (86.5-89.5 km), 91 km (89.5-92.5 km), 94 km (92.5-96.0 km) and 98 km (96.0-100.5 km)" (ll. 87-88)
Line 11: *the use of "However" here is not correct* – Thank you, it is replaced by "With regard to the uppermost height gate". (ll. 88-89)
Line 18: *change "was presented by" to "is presented in"* – Thank you, changed. (l. 95)
Line 25: c*hange "to" to "with"* – Thank you, corrected. (l. 101)
Line 26: *remove "than these ones"* – Thank you, removed. (l. 102)

Page 9636
Line 3: *remove "the" before "amplitudes"* – Thank you, removed. (l. 114)
Line 9: *Isn't 40.5h too low for a QTDW ? How do you explain that expecially that Figure 1 shows another period peak between 48h and 56h ?* – 40.5 h is within the defined range which was chosen according to earlier observations and analyses (e.g. Huang, 2013; Pancheva, 2004). Secondary maxima have not been considered even if they are closer to 48 h because we only concentrate on the largest maximum. It is now further discussed in section 2: "Note that there are cases with more than one maximum in the selected period interval, and the lower ones are disregarded here even if they should be close to 48 hours." (ll. 102-104)
Line 18: *the formula for total wind amplitudes is trivial and should not be included* – The formula is removed as well as the symbols A, Am and Az (they do not appear again). (l. 130)
Line 23: *replace "frequently" with "previously"* – Thank you, changed. (l. 134)

Page 9637
Line 1: *remove "even"* – Thank you, removed. (l. 136)
Line 2: *remove "Then," and the following sentence needs rewording* "then" is removed. We rearranged the sentences starting on line 137 and included the curve's colors to make the description more clear.
Line 4: *remove "however"* – Sentence was rewritten and moved to section 2, ll. 106-110.
Lines 4-7: *This discussion about the obtained amplitudes and the chosen window length needs to be expanded.* – A further discussion is added in section 2, lines 118-123: "Note that, if shorter data windows were used, the resulting amplitudes would be reduced. In particular, this is the case if there are 2-day bursts within the 11-day window which are not coherent. This has been discussed by Jacobi et al. (1997) who used both 11- and 5-day windows for their analysis. Choosing too small window thus would include more irregular fluctuations, while the chosen 11-day window usually covers several cycles within a QTDW burst. "
Lines 11-12: *the sentence "This ... QTDW" needs rewording* – Sentence beginning line 143 is changed to "In Sect. 3.1, we show that wind shear, taken here as a proxy for baroclinic instability, acts as a source of the QTDW."
Line 12: *change "This will be" to "This is"* – sentence rewritten (see previous comment).
Line 15: *"Partly" is ill placed in this sentence* – Thank you, removed. (l. 148)
Line 16: *add "to" before "the fact"* –added. (l. 149)
Lines 15-19: *this paragraph absolutly needs to be rewritten, it is very badly written* – The paragraph is rewritten in more detail (lines 148-154).
Line 20: *if the upper panel in Figure 2 is discussed after the bottom panel then it should be the bottom panel* –the panels are exchanged.
Line 22: *remove "the" before "different"* – Thank you, removed. (l. 157)
Line 28: *change "again" to "same as in Figure 2"* - –changed. (l. 162)

Page 9638
Line 1: *the black curve denoting the period in Figure 3 is very hard to see, different coloring is needed here* – We colored the line in bold black and thin white to make it more visible.
Line 7: *change "are observed in May, too" to "are also observed in May"* – Thank you, changed. (l. 169)
Line 12: *"but is weaker expressed in 2005 and 2009" need rewording* – We added a new sentence instead: "In 2005 and 2009 the period is also largest at the onset of the wave burst and lowest at the maximum of the wave, but it is more variable inbetween." (ll. 173-175)
Lines 13-17: *it appears that the winter QTDWs is negligible according to Figure 3, this needs to be said here and compared to other studies* – indeed that maximum is small on a long-term average. This is, however, comparable with earlier results of MLT radar winds (e.g. Muller and Nelson, 1978)
Line 19: *add "of" after "months"* – Thank you, it's added. (l. 187)
Lines 24-26: *the sentence "This can be ... 49.3h)" needs rewording, there is no way the reader can understand what the authors want to say here* – The sentence is rewrittem: "The median for large amplitudes (black columns) is 47.9h but the median for all amplitudes including small ones (white) is 49.3h." (ll. 192-194)

Page 9639
Line 26: *define SD* – Thank you for that hint. We removed the acronym because standard deviation is not used very often. (l. 221,222)
Line 28: *add "," after "gates"* – changed to „lower gates“ (l. 217)

Page 9640
Line 6: *replace "if" with "when"* –replaced. (l. 222)
Line 9: *needs rewording, "by" is repeated before and after the vertical wavelength formula* – Thank you, the mistake is corrected. (ll. 231)
Lines 9-11: *here the authors say that they use the same period for all heights but they don't explain why and the sentence is seriously ill-written* – Thank you, it is rewritten: "For this analysis, the same period has to be used for each height gate to obtain consistent phases. Therefore, for wavelength calculation, we repeated the QTDW analysis for each height gate with the period found for 91 km." (ll. 231-234)

Page 9641
Line 17: *change "both ways" to "both methods"* – Thank you, it is replaced. (l. 264)
Line 20: *add "," after "amplitude"* – Thank you, comma is added. (l. 267)
Line 22: *the sentence needs to end at "shear" and a new one started, rewording is necessary here* – Thank you, the sentence is rewritten. (l. 268-269)
Line 24: *another word is needed instead of "relation"* – Thank you, we use "effect" instead. (l. 270)
Line 26: *change "for" to "at"*– Thank you, it is replaced. (l. 271)

Page 9642
Line 10: *replace "in the figure" with "in Figure 10"* – Thank you, it is replaced. (l. 281)
Line 20: *remove "to"* – Thank you, it is removed. (l. 289)
Line 25: *change "to" to "with"* – Thank you, it is replaced. (l. 293)
Lines 27-28: *move "is" before "slightly"* – Thank you, it is re-ordered. (l. 295)

Page 9643
Line 2: *add "the" before "correlation"* – Thank you, it is included. (l. 297)
Line 4: *add "," after "altitude"* – Thank you, it is added. (l. 299)
Line 5: *change "a lot" to "significantly"* – Thank you, it is changed. (l. 299)
Line 7: *"and not that much determined" needs to be reworded* – Thank you, it is changed to: "[...]

instead of being determined by mesospheric circulation." (l. 301-302)