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Interactive comment on "Tropical temperature variability and Kelvin wave activity in the UTLS from GPS RO measurements" *by* Barbara Scherllin-Pirscher et al.

Anonymous Referee #2

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Summary

Scherllin-Pirscher et al. use radio occultation data collected between 2002 -2014 to analyse Kelvin wave activity and variability. The authors investigate temperature variance in the upper troposphere and lower stratosphere and examine the contributions to the total temperature variance from sources such as Kelvin waves and quasi-stationary wave activity. Scherllin-Pirscher et al. examine the relationship between peak Kelvin wave activity in the tropopause region and how it relates to deep convection. While the paper contains some interesting results and is well written, I would like the authors to consider the following points as they redraft their manuscript in preparation for publication in ACP.

General Comments

1) The authors use the phrase 'high frequency' throughout the manuscript which they define (Section 2.3) as those waves with periods shorter than 100 days. This is quite misleading given the usual definition of 'high frequency' waves refers to gravity waves, or perhaps, waves irresolvable in your data binning . Kelvin waves and gravity waves are known to drive the QBO, thus you should change this phrase to 'Kelvin-wave band' or 'monthly – seasonal band' or similar. And then your 'low frequency' band could be referred to as 'seasonal' or similar. Please change notation in Figures to reflect these changes in terminology too.

2) Usually upon using the Hayashi (1971) space-time spectral analysis method, authors retain Kelvin wave information in wavenumber-frequency space based on equivalent depths derived from Matsuno's (1966) shallow water equations. For example, see Wheeler & Kiladis (JAS 1999) for OLR and Ern et al. (ACP, 2008) for SABER and ECMWF temperatures in the stratosphere. Some comments on why a simple k=1,2 and $7<T<30$ day periods filter is chosen in this manuscript is necessary. Also note that the wavenumber-frequency spectrum will change between the troposphere and stratosphere. Specifically, the spectrum will move to peak at higher frequencies in the stratosphere because higher frequency Kelvin waves propagate into the stratosphere more easily. Please investigate and discuss the wavenumber-frequency results at higher & lower altitude to confirm the validity of your filter limits and/or consider using equivalent depth filters instead.

3) Figure 2a: What role might the lapse-rate tropopause gradient play in the zonal anomalies shown here? That is, are you confident that you are removing all effects of the tropopause itself from this anomaly plot? I wonder in Figure 4b how or if the sharpness of the tropopause might influence these mean annual cycles of temperature anomalies – noting that the maximum positive and negative anomalies are right on the tropopause altitude? Do these maximum anomalies change in altitude following the seasonal cycle of tropopause altitude itself?

Minor Comments

P7 line 20: What are you defining as ‘high frequency’ here?

Figure 3: Worth noting that W=westerly, E=easterly to avoid confusion between westerly/westward.

Figure 10: Replot the boxes on top of the green, red, blue lines as it’s not well presented at the moment.

Technical corrections, grammar, etc.

P2, Line 10: ‘were theorised by Matsuno’

P2, Line 16: ‘important role in the stratosphere –‘

P3, line 13: ‘Due to the RO measurement’

P3, line 16 & 17: change ‘are’ to ‘were’

P3, line 24: ‘information on convection’

P3, line 27: ‘vertically-resolved’

P4 line 18 ‘Gaussian filter (with’

P8 line 4 & 5: Boreal or austral spring 2003 & 2004?

P9 line 6 ‘these data ideal for characterizing’

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