

Interactive comment on “Comparison of equatorial wave activity in the tropical tropopause layer and stratosphere represented in reanalyses” by Young-Ha Kim et al.

Anonymous Referee #1

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This paper presents analysis of stratospheric equatorial waves in several reanalysis data sets, focusing on standard space-time spectral analysis of Kelvin and Mixed Rossby Gravity waves. The analyses are mostly straightforward and the results show reasonable agreement among the reanalyses (and with previous publications), with a few outliers identified. Long-term variations in wave variances show changes likely related to input satellite data sets, in particular the transition from TOVS to ATOVS in 1998. Comparisons are also made for derived EP fluxes for the Kelvin and MRG waves. The overall results provide quantitative information on tropical wave behavior among the reanalyses, and the paper makes an original and useful contribution to the SRIP evaluations. The paper is reasonably well written and is appropriate for ACP. I

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have a number of mostly minor comments for the authors to consider in revision.

1) The inclusion of JRA55C (no satellite data) is especially nice for quantifying the influence of satellite data in the reanalyses, and I'm surprised at how small the differences are with JRA55 at upper levels (where radiosonde data are sparse). How should this result be interpreted, i.e. are these wave spectra mostly characteristic of the forecast model, or are upper levels constrained by lower levels?

2) Figure 11 uses the Singapore zonal winds as a standard reference for all reanalyses. Are there any systematic differences found using the zonal winds from the separate reanalyses instead of a single reference? Does behavior of the equatorial waves in the different reanalyses 'feel' the differences in zonal winds identified in Kawatani et al (2016)?

3) Can you please add a right hand axis indicating period (in days) for the various spectra (Fig. 1, 2, 9,10,13). The discussions in the text are all based on wave period, and it would be helpful to simply see this on the figures.

4) Are there any systematic seasonal variations in the Kelvin and MRG spectra at lower levels (100 hPa) identified in the reanalyses? Since you have long records of monthly statistics it would be easy to identify such behavior.

5) The EP flux calculations are complicated and it would be helpful to have a direct reference to the calculations used here (beyond the standard Andrews 1987 textbook). Are these calculations identical to those used in Kim and Chun (2015)? How do the climatological EP fluxes here compare to other published results?

6) The composited phase-speed spectra results are very nice (Fig. 11). For the conversion from frequency to phase-speed there is a factor of zonal wavenumber needed to conserve spectral density (see Randel and Held, 1991, JAS). Has this been incorporated in these calculations? While the composite results are revealing, it would be interesting to see the variability of some of these diagnostics within the composites, for

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example perhaps showing a 'spaghetti plot' of the separate composited time series to see the actual variability, within and among the reanalyses. Could this be included as a Supplementary figure?

7) A recent paper on observed lower stratosphere Kelvin waves is Scherrlin-Pirscher et al 2017 doi:10.5194/acp-2016-576, and this might be a useful reference to include.

8) The high frequency disturbance in the meridional wind at upper levels has some characteristics similar to the so-called 2-day wave (zonal waves 3-4, ~2 day period, occurrence in strong easterly winds); see e.g. <https://doi.org/10.1029/2009JD012239>. It might be useful to look at the latitude-height structure of the waves for a tentative identification.

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