

Interactive comment on “Wave fluxes of equatorial Kelvin waves and QBO zonal wind forcing derived from SABER and ECMWF temperature space-time spectra” by M. Ern and P. Preusse

Anonymous Referee #1

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‘Wave fluxes of equatorial Kelvin waves and QBO zonal wind forcing derived from SABER and ECMWF temperature space-time spectra’, by M. Ern and P. Preusse.

General Comments:

This paper quantifies Kelvin wave momentum flux in the stratosphere using satellite data (SABER) and operational analysis data (ECMWF) over two full QBO cycles. The zonal mean flow accelerations are also quantified. Results indicate the importance of Kelvin wave forcing of the QBO during westerly shear phase, but at other times Kelvin wave forcing is very low and so the forcing is likely driven by mesoscale gravity waves.

The results contained in this manuscript are interesting, important, novel and topical.

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The paper is very well written in clear English and is well structured. The results provide useful information on the changing Kelvin wave fluxes and forcing throughout the QBO cycle. The results also demonstrate clearly the ability of SABER satellite data to determine these quantities in a global context.

This paper will be ready for publication in ACP once the authors have considered the following minor points.

Specific Comments:

Momentum fluxes and accelerations are small, derived parameters. It would be beneficial to make an estimate of the uncertainty in these parameters for Kelvin waves and discuss this in the manuscript. Ern et al (2004) discussed gravity wave momentum flux errors from CRISTA and noted that uncertainties in the horizontal wavelenghts played a large part in the errors. Because of the known horizontal wavelenghts of Kelvin waves, I imagine that the relative errors of momentum flux and acceleration of Kelvin waves would be smaller. The SABER temperatures themselves must have an uncertainty – the smoothing of data before calculating the accelerations in Figure 9 compared with Figure 7 seems to suggest so.

P5631, line 21: Why do you not separate the spectra into symmetric and anti-symmetric components? I guess this is because of the domination of the equatorial spectra by Kelvin waves? If so, please mention this here.

P5638 line 13: This enhancement looks to be just inside or at the edge of the $n=1$ equatorial inertial gravity wave band (e.g. Wheeler & Kiladis JAS 1999, Ern et al. ACP 2008), although as mentioned in the text this enhancement may be due to spectral aliasing.

P5638, para 3: Were SABER data assimilated into ECMWF during the period 2002 – 2006?

P5640, lines 11-14: You can remove the sentences ‘For comparison also... solid con-

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four lines' because these are mentioned in the caption of Figure 3.

P5644, lines 20 – 22: Once again, you could remove the sentences 'The values given. . . mean zonal wind' as they're in the Figure 6 caption.

P5646, para 1: A large part of this paragraph repeats the Figure 7 caption. If possible, it would be good for this to be condensed in either the text or the caption to avoid repetition.

P5653, line 9: The ECMWF winds could also be added to each panel in Figure 10 to aid clarity of the discussion.

P5653, line 22: When you say, 'QBO east periods', do you mean 'easterly', 'eastward', 'easterly shear', 'eastward shear'? Please clarify.

Technical Corrections:

P5627, line 23 -24. Reword to read 'In addition, recent high resolution. . .'

P5640, line 18: Change to read: '... of the variances are'

P5642, line 24: Add in Singapore's latitude: 1N

P5653, line 9: Change to read: 'Figure 10 shows latitude-time. . .'

P5673, figure 6 caption, line 3: Should this read 'tendency (a), the meridional advection. . .'?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5623, 2009.