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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Properties of the average distribution of equatorial Kelvin waves investigated by ray tracing techniques" *by* M. Ern et al.

Anonymous Referee #1

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<Over view> In this paper, the authors studied the zonal mean Kelvin wave activity in 15S-15N mean field using GROGRAT model. In their investigations, ECMWF analyses and SABER measurements were taken as reference. The authors showed following results by conducting several interesting experiments: Radiative wave damping is mainly responsible for the shift of the Kelvin wave spectral peak with altitudes; stratospheric distribution of Kelvin wave variances are only simulated if the source altitudes are set above $\sim$14km; seasonal variations of the source spectra are important to explain all of the variation of Kelvin wave variance in the stratosphere; confirm suitability of both rain rate and OLR data as good proxies for deep convection and latent heat release in the tropics. These results are interesting and make a contribution to our understanding of

the global Kelvin wave activities. Therefore I recommend its publication after my minor comments below are addressed.

<General comments> (1) The authors calculated pseudo zonal wind spectra from the temperature spectra via the polarization relations. I understand the reasons, but I believe that the authors should mention how much the differences between pseudo zonal wind spectra and original ECMWF zonal wind spectra were seen.

(2) The author considered Kelvin wave band with 8m < he < 2000 m in the zero background wind, and give the source spectra at the source altitudes of 4.9 km, 8.5 km, 11.4 km, 13.9 km, 16.9 km, and 18.7 km. There is one problem. For example, when the background zonal wind is eastward (U>0) and waves propagate westward in a fluid (intrinsic Cx is negative) but |U| > |intrinsic Cx|, these waves propagate eastward relative to the ground (Cx>0), which could be extracted as "Kelvin waves". I guess the authors noticed this point as discussed in Ern et al. (2008), but some explanations are needed in this paper.

(3) The authors set source levels with different altitudes and consider only vertical wave propagation. However, zonally non-uniform background zonal wind in the troposphere (i.e., the Walker circulation) must affect the distribution of stratospheric Kelvin waves propagating both eastward and upward from the troposphere (see details in Suzuki and Shiotani, 2008 JGR, 113, doi:10.1029/2007JD009456; Kawatani et al. 2009, JGR, 114, doi:10.1029/2008JD010374). I wonder source launch levels set in the troposphere is suitable for investigation of stratospheric Kelvin wave distribution in the present technique. It might be no problem in the experiments with the source level set above the lowest stratosphere where the zonal wind is nearly zonally uniform. I guess this point might be beyond scope of this study. However, it should be discussed or mentioned this point somewhere in the paper.

<Specific comments> P13046: Since only Kelvin waves are investigated here, the equation (3) is not needed.

P13048: Kelvin waves have meridional wind component in a sheared background wind. (see Imamura 2006, JAS, 61, 1623-1636, and reference therein).

P13054 (Fig.3): Why high bias above 45 km altitude is removed if the source altitude is chosen higher than 20 km?

Figs.10-15: Nearly same figures are shown continuously, but the authors did not mention much about these figures in the text. It is better to select some specific figures.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 13039, 2009.