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Atmos. Chem. Phys., 9, 7973-7995, 2009

www.atmos-chem-phys.net/9/7973/2009/

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Properties of the average distribution of equatorial Kelvin waves investigated with the GROGRAT ray tracer

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Abstract. Kelvin waves excited by tropospheric convection are considered to be one of the main drivers of the stratospheric quasi-biennial oscillation (QBO). In this paper we combine several measured data sets with the Gravity wave Regional Or Global RAY Tracer (GROGRAT) in order to study the forcing and vertical propagation of Kelvin waves. Launch distributions for the ray tracer at tropospheric altitudes are deduced from space-time spectra of European Centre for Medium-Range Weather Forecasts (ECMWF) operational analyses, as well as outgoing longwave radiation (OLR) and rainfall data measured by the Tropical Rainfall Measuring Mission (TRMM) satellite. The resulting stratospheric Kelvin wave spectra are compared to ECMWF operational analyses and temperature measurements of the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) satellite instrument. Questions addressed are: the relative importance of source variability versus wind modulation, the relative importance of radiative and turbulent damping versus wave breaking, and the minimum altitude where freely propagating waves dominate the spectrum.

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Citation: Ern, M., Cho, H.-K., Preusse, P., and Eckermann, S. D.: Properties of the average distribution of equatorial Kelvin waves investigated with the GROGRAT ray tracer, Atmos. Chem. Phys., 9, 7973-7995, 2009. ▣ [Bibtex](#) ▣ [EndNote](#) ▣ [Reference Manager](#)

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