# Non-radiative dissipation of stratospheric Kelvin waves

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We present an analysis of tropical temperatures in profiles retrieved from GPS radio occultation measurements. Variance associated with Kelvin waves of zonal wave numbers up to about 5 and phase speeds ranging from 10 to 50 m/s are very well resolved by the gridding and spectral analysis methodology used. The vertical propagation of Kelvin wave packets above 100 hPa identified in these profiles can be very well described by the transport equation for wave activity, assuming a slowly varying, zonal background state. Below 100 hPa this description fails, likely due to substantial zonal asymmetries in the background flow. However, assuming the scale-dependent parameterization of radiative dissipation due to Fels (1982) cannot explain the attenuation of the observed wave packets in westerly shear zones of the QBO. The parameterized radiative heating rates agree well with those computed by an offline radiative transfer calculation, suggesting the presence of a non-radiative mechanism of roughly equal importance to the longwave radiative dissipatiton. A similar analysis of tropical temperatures in an integration with the Whole Atmospheric Community Climate Model (WACCM) suggests that a non-radiative dissipation mechanism of similar amplitude is present as well. No evidence is found in the retrieved temperature profiles for large-scale convective overturning of the Kelvin waves in regions where they are attenuated, nor is there evidence for large-scale shear instabilities in ERA Interim winds. It is hypothesized that localized breaking of small-scale gravity waves are responsible for this dissipation.

Key words: kelvin waves, GPS radio occultation, quasi biennial oscillation

**References**

Fels, S. B., 1982: *Journal of the Atmospheric Sciences*, **39**, 1141-1152.