



Equatorial Kelvin waves, cirrus clouds, and dehydration in the tropical tropopause layer

FJ Immler (1), K Krüger (2), M Fujiwara (3), and O Schrems (4)

(1) Deutscher Wetterdienst (DWD), Meteorologisches Observatorium Lindenberg, Germany (e-mail: franz.immler@dwd.de),
(2) IFM-GEOMAR, Kiel, Germany, (3) Hokkaido University, Sapporo, Japan, (4) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

A number of field-campaigns in the tropics have been conducted in the recent years with the mobile LIDAR systems MARL and ComCAL aboard the research vessel Polarstern in the tropical Atlantic and at Paramaribo in Suriname (5.8°N, 55.2°W). The lidars detected particles in the atmosphere with high vertical and temporal resolution and are capable of detecting extremely thin cloud layers which frequently occur in the tropical tropopause layer (TTL). We investigated the occurrence of clouds in the TTL with a newly developed trajectory model and found that ice particles form in slow ascent and efficiently dehydrate the air [Immler et al., 2007]. The Lagrangian temperature history thus defines the water vapour transported to the stratosphere in the tropics. Radiosonde as well as ECMWF operational analysis data show a strong influence of eastward moving equatorial Kelvin waves on the temperature at the tropical cold point tropopause (CPT). We find a clear correlation between the temperature anomalies introduced by these waves and the occurrence of thin cirrus. This finding suggests an influence of Kelvin wave activity on the dehydration characteristics of the TTL [Fujiwara et al., 2001, Immler et al. 2008].

References:

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