



On the existence of an upper tropospheric warming maximum in the tropics

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Simple thermodynamic considerations and most coupled and uncoupled climate models predict that the warming near the surface in the tropics is accompanied by even stronger warming in the tropical mid- to upper troposphere. At the same time, observed ocean depletion in the tropics suggests cooling in the lower stratosphere and near the tropopause. It is challenging to find this predicted warming also in observations. Raw radiosonde temperature time series show cooling in the upper troposphere, at least from 1979-present. This cooling is likely caused by changes in instrumentation, but homogenization efforts have so far been unable to remove this cooling bias. Temperature data derived from the Microwave Sounding Unit (MSU) show better consistency with model data but have rather low vertical resolution.

Results from a new homogenization effort that able to reveal the upper tropospheric warming maximum also in radiosonde temperature data are presented. While the upper tropospheric warming maximum is robust and in relatively good agreement with climate model predictions, the warming is still lower than expected in the lower- to mid troposphere. Near the tropical tropopause (ca 100 hPa), there is now large discrepancy (0.5K/decade) between trends from raw and homogenized radiosonde data. A caveat is made on the use of radiosonde data to validate theories about the behaviour of the tropopause region. The authors are interested in feedback regarding the explanation of the observed profile of atmospheric trends and variability.