



## **Regional tropical temperature trends from radiosondes, reanalyses, and satellite observations**

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We compare seasonal 20th century atmospheric temperature trends in the Tropics (30°S-30°N) from radiosonde observations (CHUAN, HadAT, IUK, RAOBCORE/RICH, RATPAC) and reanalyses (ERA-40, NCEP/NCAR (NNR), Twentieth Century reanalysis (20CR), CFSR, ERA-Interim, MERRA). Large differences are found between the magnitudes, vertical profiles of the temperature trends (even for time periods > 3 decades), and chronological sequences of bidecadal, regional warming and cooling periods in the reanalyses. Long term zonal mean vertical trend profiles from CHUAN and from the reanalyses reaching back to the time before the satellite era reveal an amplified upper tropospheric warming for all longest periods of dataset overlap (1901-99, 1901-57, 1948-99, 1957-99). ERA-40 and NNR show a second warming maximum in the lower troposphere which is missing in 20CR. The agreement of the vertical structure and temporal behaviour of regional, bidecadal trends in the long reanalyses for 4 regions in the Tropics with CHUAN is generally best for ERA-40, followed by a less good agreement with trends from NNR and 20CR. The performance of ERA-40 is best in the Americas sector, and less so in the Asian and Pacific sectors. The agreement of NNR with CHUAN is significantly worse than that of ERA-40 for all tropical regions, especially with respect to the vertical structure of the trends. The 20CR temporal behaviour and vertical structure of the tropical trends is often different from CHUAN, ERA-40 and NNR, especially around the tropopause, and in all sectors. For the more recent but shorter reanalyses, ERA-Interim is generally closer to ERA-40 than CFSR and MERRA. For the period of overlap (1951-99) CHUAN itself agrees reasonably well with HadAT, IUK, RAOBCORE/RICH and RATPAC on the general picture. However, some disagreement on the trend sign can be seen a) for the American sector during 1961-80 with RAOBCORE/RICH and RATPAC and during 1971-90 with RAOBCORE/RICH, b) for the Asian sector during 1961-80 with RAOBCORE/RICH.