Inter-comparison of upper air temperature over China between Radiosonde and Reanalysis Data

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Based on quality controlled(RAW) and homogenized(ADJ) radiosonde temperatures at 850-30hPa from 118 stations in China and monthly mean temperatures from eight reanalysis datasets(REA) which included NCEPv1, NCEPv2, ERA-40, ERA-Interim, JRA55, 20CR, MERRA and CFSR, a preliminary comparison of upper air temperatures over China between radiosonde and reanalysis was undertaken. The mean difference, correlation, standard deviation and linear trend between RAW and ADJ, REA and RAW, REA and ADJ during 1981-2010 were analyzed and results demonstrated ADJ temperatures averaged in China were generally cooler than RAW and the negative adjustments were the most significant at the upper troposphere and the lower stratosphere. Homogenization removed the system error caused by radiosonde instrument and observation system update from RAW. Hence the correlations between REA and ADJ were higher than those between REA and RAW. ADJ is more suitable than RAW as an evaluation index of reanalysis data. The mean difference between REA and ADJ were about 1C during 1981-2010, while REA were generally cooler than ADJ in the troposphere and warmer in the stratosphere. Significant correlations proved the consistence of annual variability between REA and ADJ. The linear trends are consistent between REA and ADJ with warming in the lower and middle troposphere and cooling in the middle stratosphere. More uncertainly were revealed at the upper troposphere and the lower stratosphere. ERA-Interim, JRA55 and MERRA were generally closer to ADJ than other reanalysis datasets.