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The Main Bias and Correction of Chinese Radiosonde Temperature and Humidity Data

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The climate of China has significant regional features. The unique circulation system and the thermal and dynamic effects of the Tibetan Plateau make the regional climate change of China an important part of global climate change. The long time series of radiosonde data is an important basis for the study of regional climate change in China. At present, there are more than 120 radiosonde stations in China. Due to the changes of observational time, observational methods, instruments and their error correction methods, the radiosonde data is not homogeneous in time and space. The statistical results of Chinese radiosonde data from 1979 to 2013 reveal that there is large difference between the Chinese radiosonde temperature and ERA-interim reanalysis data, especially in higher mandatory levels. The average bias from 1979 to 2000 on 100hPa can reach 1.43 [U+2103], but the average bias is only 0.47 [U+2103] from 2000 to 2013. The obvious discontinuity bias is mainly related to the update of Chinese radiosonde system in 2000 and 2001, which is included in a comprehensive revision of multiple error correction methods. In addition, after 2002, the radiosonde instruments in China changed from the 59-701 type to the L -band type. After that, the radiosonde data of humidity and temperature appeared obvious discontinuity. In particular, the relative humidity data of all the mandatory layers in each radiaosonde stations showed consistent discontinuity problems. The difference between the average annual relative humidity data before and after the use of L-band instruments reached 16.7% on 100 hPa. Such problems have affected the objectivity and reliability of the research on regional climate change in China. It is very important to carry out some reasonable corrections to Chinese radiosonde data. At present, we have done some bias correction work on monthly and daily Chinese radiosonde temperature and humidity data. With the help of breakpoint judgment method combined of statistical test and metadata check and a large number of tests done for the correction quantity of different time scales, most of the main reasons for the bias of Chinese radiosonde data are revealed. Compared with the ERA-interim reanalysis data, the large bias before 2001 is significantly reduced after the corrections.