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Long-term Free-Atmosphere absolute Humidity Trends in China Derived from Homogenized In situ Radiosonde Dew Pont Temperature Series

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Based on homogenized radionsonde dew point temperature time series of 92 selected stations in China, long term trends of upper air absolute humidity and atmospheric perceptible water from 1958 to 2005 are studied. We applied quality control and homogenization to obtain reliable time series which have been performed to adjust temperature time series. The vertical profile of absolute humidity trend during 1958-2005 exhibited that absolute humidity averaged in China at the lower troposphere (from 850 hPa to 700 hPa) tended to increase, and the amplitude of trend at 850 hPa is larger than that at 700. Meanwhile, absolute humidity tended to decrease in middle and upper troposphere (from 500 hPa to 200 hPa), and decreasing trend was more evident at 500 hPa. During 1958-2005, trend of atmospheric precipitable water averaged in China in the lower troposphere also tended to rise. Both humidity and precipitable water rising trends in winter and summer are more significant in 1958-2005 while both trend in summer from 1979-2005 is the largest among four seasons. On the whole, 1970-1989 was a dry period by both humidity and perceptible water. The spatial distribution of absolute humidity trends at 850hPa were homogeneous with wetting trend at most stations in China, while the trends at 700, 500 hPa and upper levels, trends differed with stations. Trends were generally wetting in the lower troposphere 850 and 700hPa. In the middle troposphere, absolute humidity at stations south of the Yangtze River tended to decrease and that at the rest station in China tended to increase. At upper troposphere, trends at more stations tented to decrease with maximum stations at 300 hPa which is possible related to cooling at upper troposphere and changes of tropopause height during 1958-2005.
keywords: China, free atmosphere, radiosonde, humidity, trend