Synchronized increase of extreme cold and warm events in China during the recent global warming slowdown

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From the end of 1990s to the middle of 2010s, global mean temperature experienced a process of warming slowdown. However, global warm extremes did not show the slowdown phenomenon during the recent global warming slowdown. Based on the observation data of 2362 land surface stations in China, we analyzed the cold and warm extremes changes over mainland China between global warming period (1961-1999) and warming slowdown period (2000-2014). Results indicate that the warming trend in the cold season (MAM and DJF) is significantly higher than that in the warm season (JJA and SON) in the period of global warming (1961-1999), while the warming trend in the warm season is significantly higher than that in the cold season in the period of global warming slowdown. That is, the trend of warm season and the cool season in China have reversed. At the same time, we also found that the synchronous increase occurrence of extreme warm events in summer (JJA) and extreme cold events in winter (DJF) leads to the seasonal trend reverse phenomenon, but there are differences in the spatial variation characteristics between cold and warm extremes. The increase of warm extremes in summer is mainly due to the strong increase of warm events in south China, while the increase of cold events in winter is due to the increase of cold events over China. Further, we also found that the variability of extreme temperature has increased more significantly in the warming slowdown period than that in global warming period. East Asian winter monsoon and summer monsoon both show enhanced characteristics during the global warming slowdown period, which indicates that the increase of sea-land temperature difference in summer and winter results in the synchronous increase of extreme cold and warm events by increasing the climate variability in China.

Keywords: Global warming, Global warming slowdown, Extreme warm events, Extreme cold events, Land-sea temperature difference

