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Changes of flash droughts over China

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The rapidly evolving drought events, which are recently termed as “flash droughts”, can seriously affect vegetation and water supply due to extreme heat, low soil moisture and high evapotranspiration (ET). The changes of flash droughts are not only caused by natural climate variability similar to the traditional drought events, but also associated with global warming since abnormally high temperature is an important criterion for the triggering of flash droughts. Here, we have assessed the long-term trend and variability of flash droughts over China from 1979 to 2010, based on over two thousand meteorological observations of surface air temperature and three global reanalysis products for the soil moisture and ET estimations. Our results suggest that the flash droughts are most likely to occur in humid and semihumid regions, such as southern and northeastern China. Basically, there are increasing trends for flash droughts over different regions in China mainly due to the temperature increases. The increasing trends of flash droughts do not decline during the second half of the study period, but the warming hiatus does exist over many regions of China. The underlying mechanisms are being attributed by investigating the changes in temperature, soil moisture and ET over different parts of China. This study uniquely demonstrates the favorable regions for the occurrence of flash droughts over China, and is targeted at attributing the changes of flash droughts within the context of the understanding of the terrestrial water and energy cycle in a changing climate.