



## **Attribution of the rapid increase in flash droughts over China**

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Recently, a rapidly developing drought that is termed as “flash drought” occurs frequently in many regions across the world and has become a hot topic. The occurrence of flash drought is often triggered by heatwave and accompanied with low soil moisture and high evapotranspiration (ET). Due to its rapid onset and unusual intensity, the impact of flash drought can be devastating in some cases. Here, we investigate the long-term trend and variability of flash droughts over China based on pentad-mean surface air temperature observations from over two thousand meteorological stations as well as soil moisture and ET estimations from multiple global reanalysis products. Flash droughts are most likely to occur over humid and semi-humid regions in China. Flash drought events averaged over China have increased by 109% from 1979 to 2010, and the increase is mainly due to a long term warming of temperature (50%), followed by the contributions from decreasing soil moisture and increasing ET. To quantify the contributions of anthropogenic and/or natural drivers for flash drought, the Community Land Model version 4.5 (CLM4.5) is being forced by multiple climate models that participated in the Coupled Model Intercomparison Project Phase 5 to provide consistent soil moisture and ET data under different forcing scenarios, and an optimal fingerprinting detection method is being used to analyze the flash drought simulations. Preliminary results indicate that anthropogenic activities have exacerbated flash drought conditions over China in recent decades.