Revisiting drought trend over China during 1948-2016: a multivariate perspective

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How drought changes in the context of global warming is a concerning issue that influences the strategies of drought mitigation and drought management. Based on the simulations of the version 2 of Global Land Data Assimilation System (GLDAS-2.0) during 1948-2016, we revisited the drought trend over China and analyzed the individual contributions of precipitation and potential evapotranspiration (PET) on varied drought patterns. Four composite drought indices including the Aggregate Drought Index (ADI), Joint Drought Deficit Index (JDI), self-calibrating Palmer Drought Severity Index (scPDSI) and Standardized Palmer Drought Index (SPDI) were employed for trend detection. Results showed that all four composite drought indices suggested a significant drying belt spreads from northeastern China to southwestern China, and a significant wetting trend in the “Three river sources” areas. Controversial patterns were mainly located in the northwestern China, Xinjiang districts, and the middle and lower reaches of the Yangtze River, where the SPDI and JDI respectively, overestimated and underestimated the moisture conditions at varying degrees. According to the change point tests, it is found that the drying pattern in the northeastern China occurred since 1970s, where precipitation deficits and expanded PET jointly aggravated the drying process, while for the “Three river sources” areas, the increased precipitation since 2000s is the main driver for the wetting pattern.