



## **Attributing recent changes in droughts over China: 1961-2013**

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It is controversial how droughts respond to global warming for the commonly used drought index: the Palmer Drought Severity Index (PDSI). Here we assess recent changes in the droughts over China (1961-2013) using the PDSI with two different estimates, i.e. the Thornthwaite (PDSI<sub>th</sub>) and Penman-Monteith (PDSI<sub>pm</sub>) approaches. We found that droughts have become more severe in the PDSI<sub>th</sub> but slightly lessened in the PDSI<sub>pm</sub> estimate. To quantify and attribute that difference in the PDSI<sub>th</sub> and PDSI<sub>pm</sub>, we designed numerical experiments and found that drying trend of the PDSI<sub>th</sub> responding to the global warming alone is 3.4 times higher than that of the PDSI<sub>pm</sub>, and the latter was further compensated by decreases in wind speed and solar radiation causing the slightly wetting in the PDSI<sub>pm</sub>. Interestingly, we found that inter-basin difference in the PDSI<sub>th</sub> and PDSI<sub>pm</sub> response to the global warming alone tends to be larger in warmer basins, exponentially depending on mean temperature.

### References:

Zhang, J., F. Sun, J. Xu, Y. Chen, Y. Sang, and C. Liu (2016), Dependence of trends in and sensitivity of drought over China (1961–2013) on potential evaporation model, *Geophys. Res. Lett.*, 43, doi:10.1002/2015GL067473.

Sun, F. B., M. L. Roderick, and G. D. Farquhar (2012), Changes in the variability of global land precipitation, *Geophys. Res. Lett.*, 39, L19402, doi: 10.1029/2012GL053369.