# Attribution of the 2017 High Plains Drought

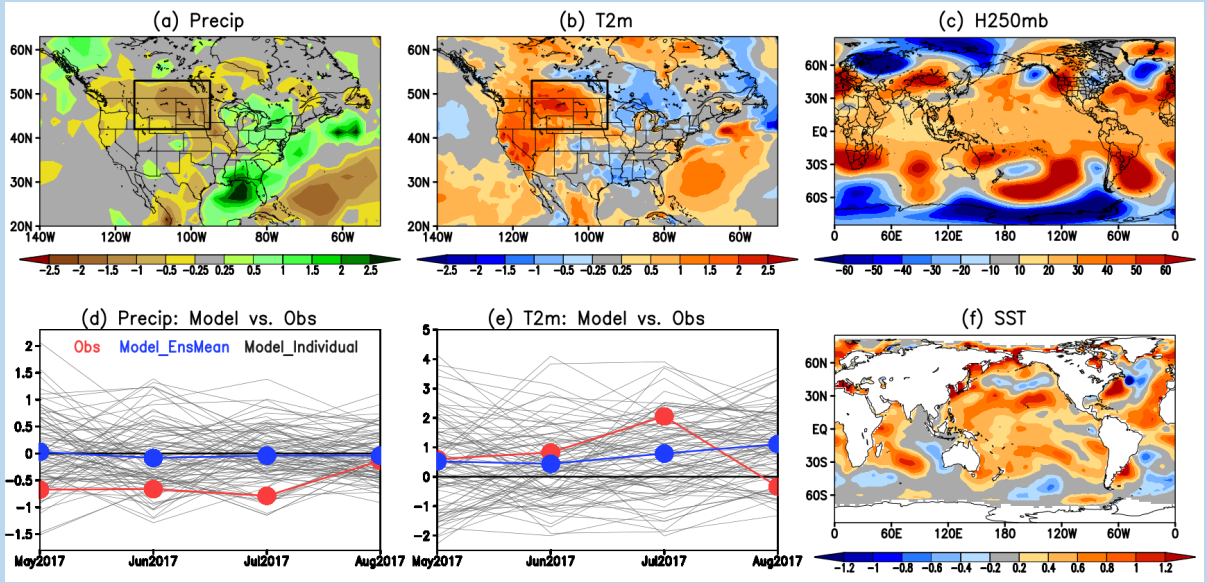
**Background:** The northern High Plains, particularly much of Montana and the Dakotas, had extreme to exceptional dryness and unusual heat conditions develop during the summer of 2017. The occurrence of the drought over Montana and the Dakotas, an important spring wheat-growing region in the country, during the crop growing season caused agricultural losses of $2.5 billion and contributed to one of Montana's worst wildfire seasons on record.

**Significance:** This study reveals the causes of the 2017 northern High Plains drought, particularly the roles of the 2017 Sea Surface Temperature (SST) anomalies and atmospheric internal variability. It also addresses the impact of the post-1901 long-term warming trend on the frequency of drought occurrence in the area.

**Analysis:** The study makes use of i) various observations and MERRA-2 to study the observed processes, ii) a set of 90 NASA GEOS AMIP simulations (1980-2017) to investigate the impacts of the 2017 SST anomalies and atmospheric internal variability on the drought in the context of current climate, and iii) a set of 12 long-term GEOS AMIP simulations (1871-2014) to assess the effect of historical warming on the occurrence of extreme dry events in the northern High Plains.

**Findings**: The 2017 northern High Plains precipitation deficits were largely the result of internal atmospheric variability. Global warming may have exacerbated the dry condition by producing surface warming and increasing the probability of heat waves there.

## May-July 2017 Anomalies




The 2017 High Plains drought was induced in part by a local positive height anomaly that persisted throughout much of May-July 2017. The NASA GEOS model results (*with tendency bias correction applied*) show that while the observed 2017 SST anomalies provided a predilection for drought by inducing surface warming, internal atmospheric variability accounts for the extreme precipitation deficits.


Wang Hailan, Siegfried D. Schubert, Randal D. Koster, Yehui Chang 2019: Attribution of the 2017 northern High Plains drought. *Bulletin of American Meteorological Society (BAMS) Special report on "Explaining Extremes of 2017"*. **99** (12): S25-29.