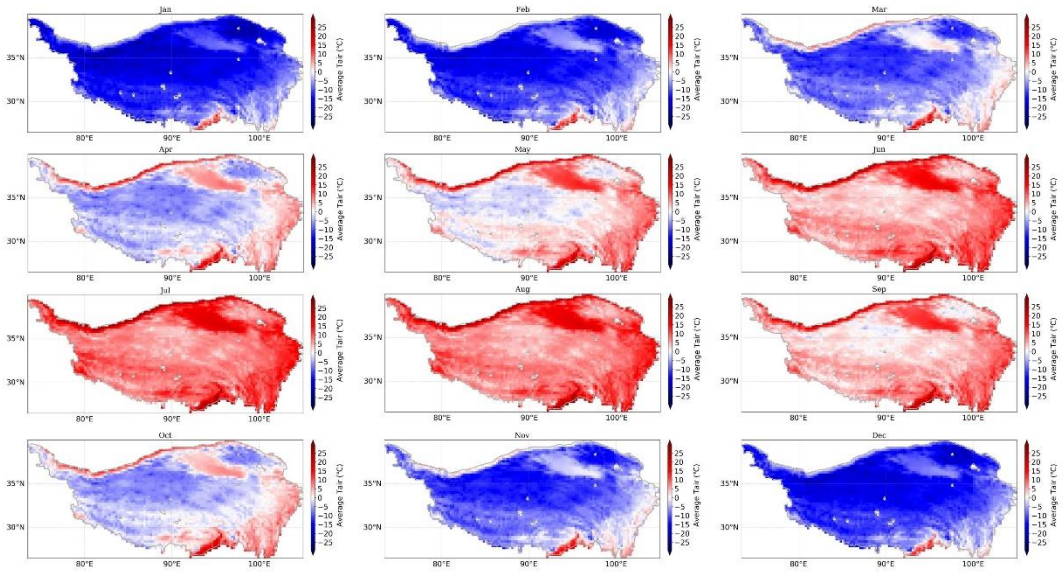

Figure S1. Monthly average air temperature (Tair/Temp) from January to December over 1961–2014. Tair/Temp are based on the gauging interpolation data provided by the Chinese Meteorological Administration (CMA). Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov and Dec are abbreviated for the 12 months from January to December.

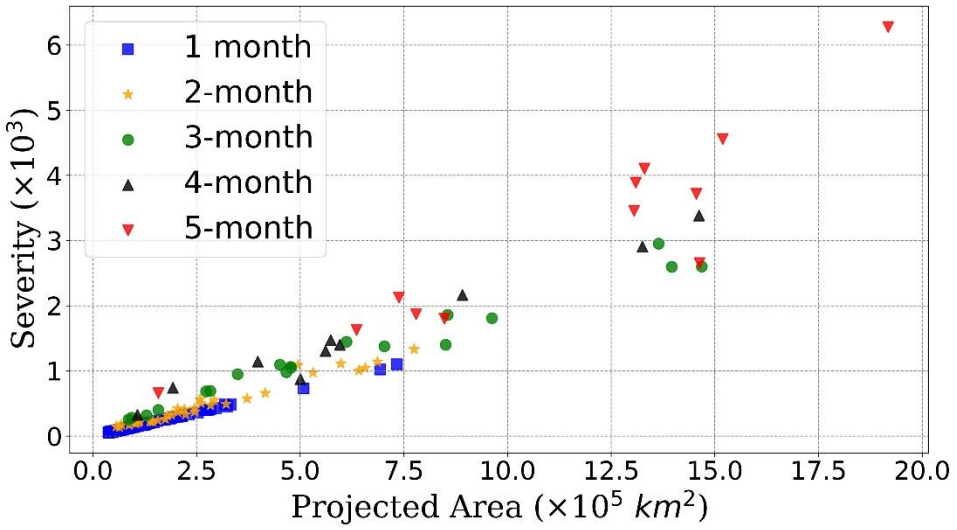

Figure S2. The drought severity and area with different durations for all identified drought events.

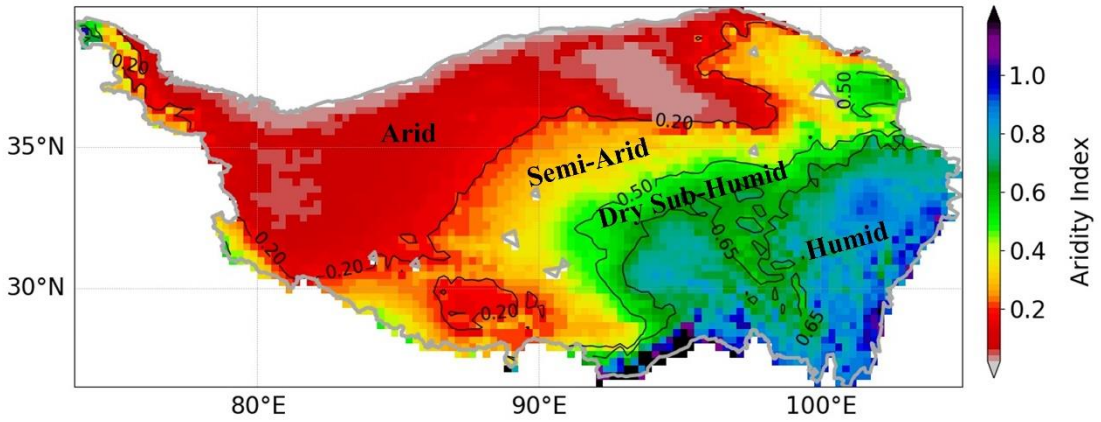

Figure S3. Map of the Aridity index (AI) for the TP (from http://ref.data.fao.org/map?entryId=221072ae-2090-48a1-be6f5a88f061431a&tab= about). Aridity index is calculated by dividing the multi-year average precipitation (Prep) using the multi-year average potential evapotranspiration (PET).

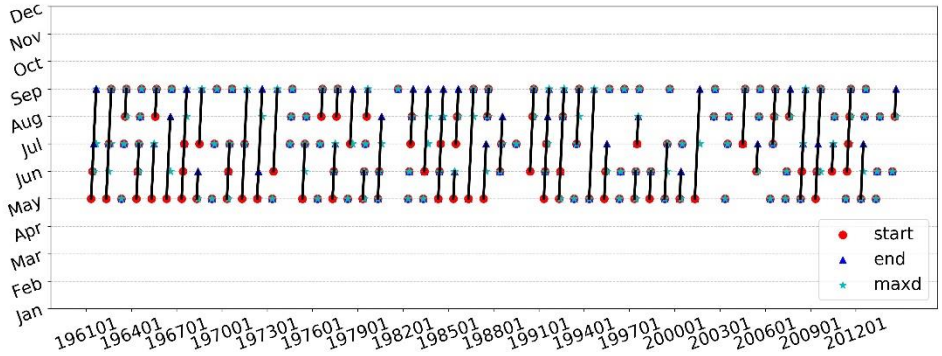

Figure S4. The start, end and maximized (maxd) severity time of the SM drought events.

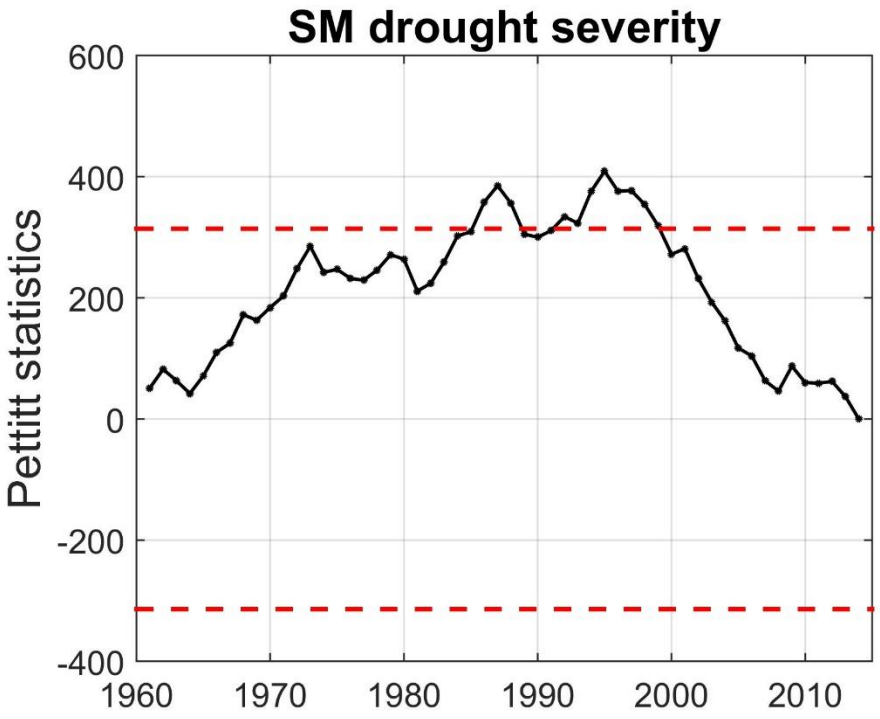

Figure S5. Pettitt statistics for the soil moisture (SM) drought severity over 1961–2014. The red dotted lines represent the statistics at the significant level of p = 0.05.

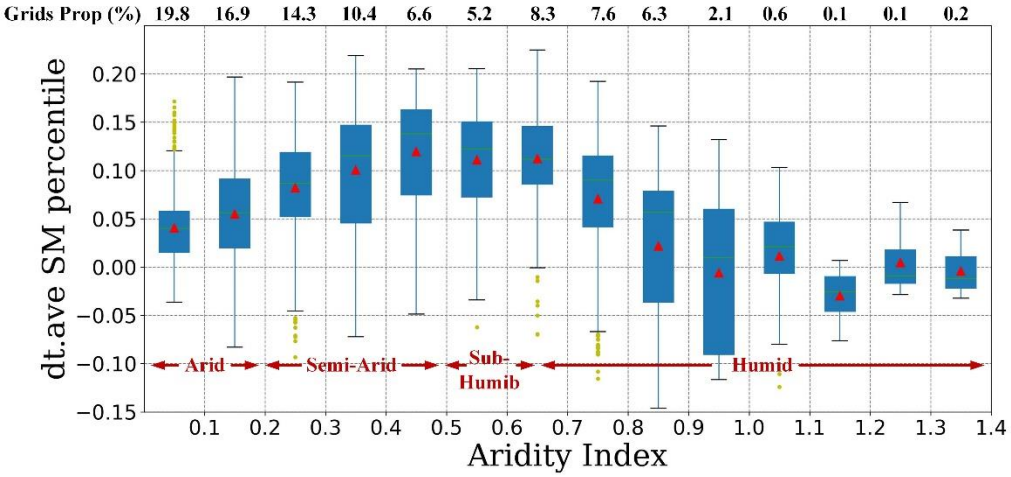

Figure S6. Difference of the average SM percentile (dt.ave SM percentile) for summer periods of May–September between the period of 1995–2014 and 1961–1994. The upper limb, the lower limb, the blue line and the red △ represent the upper quartile (h1), the lower quartile (h2), the median and the mean. The whisker ranges from h1 − 1.5(h2 − h1) to h2 + 1.5(h2 − h1). The upper numbers are the proportions (%) of the grid pixels with their Aridity index (Figure S3) falling in the corresponding intervals.

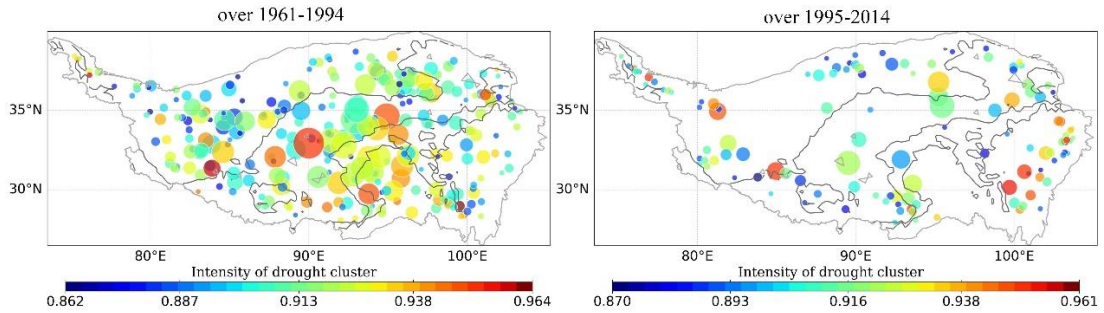

Figure S7. Map of the drought clusters over the period of 1961–1994 and 1995–2014. The circle center is the centroid of the drought cluster and the circle size represents the area of the drought cluster.

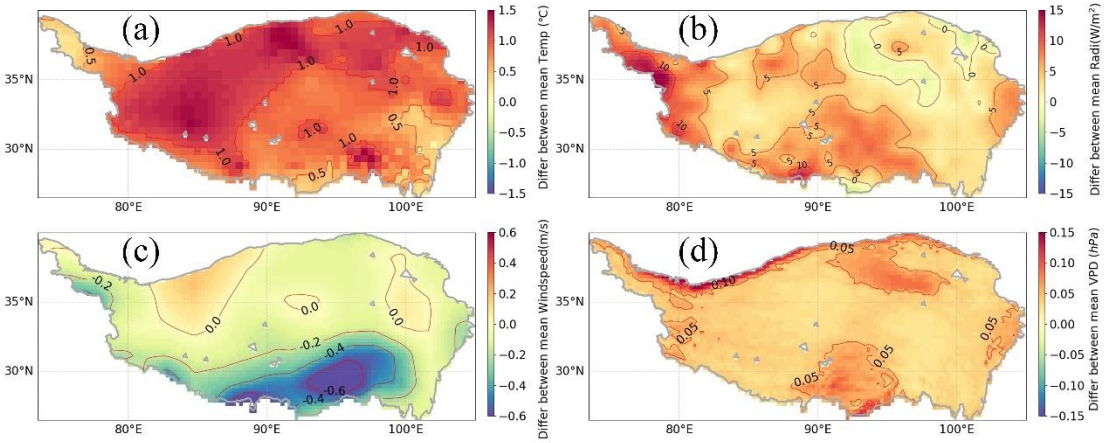

Figure S8. Difference (Differ) between the average state of the air temperature (Temp) (a), radiation (Radi) (b), Wind speed (Windspeed) (c) and vapor pressure deficit (VPD) (d) over the stage of after and before mid-1990s.

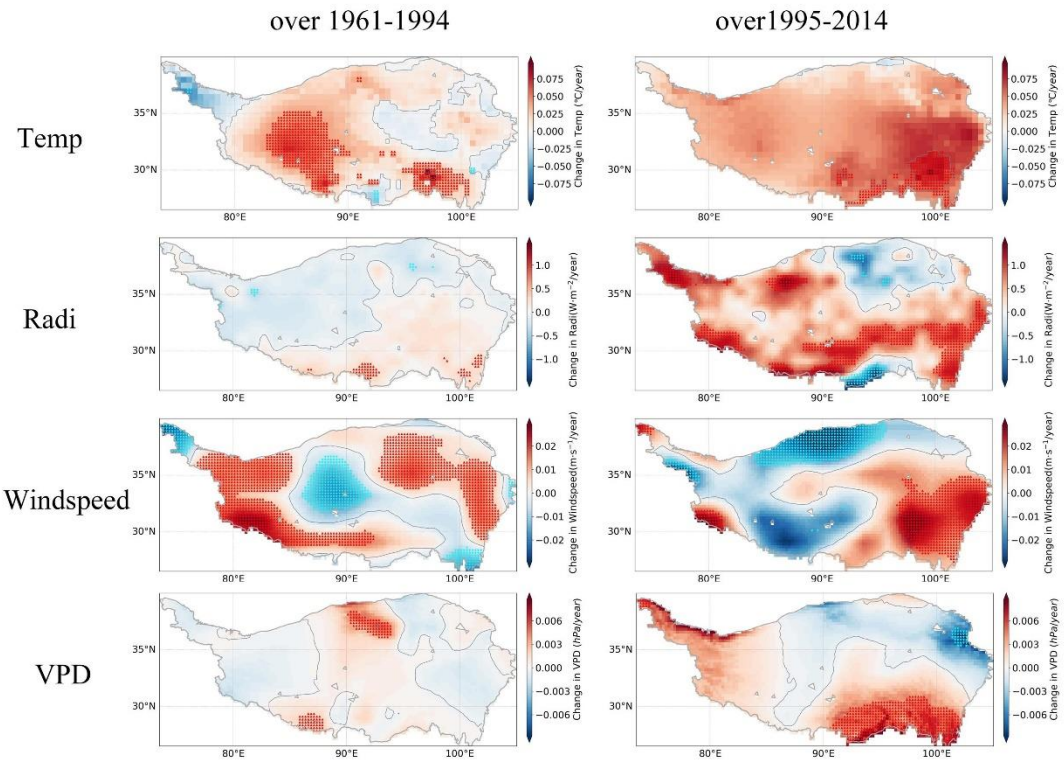

Figure S9. Spatial distribution of the trends in air temperature (Temp), downward radiation (Radi), wind speed (Windspeed) and vapor pressure deficit (VPD) over 1961–1994 and 1995–2014. Note that the △/▽ with cyan/red denote the significant ($p < 0.05$) increasing/decreasing trends.