"Dry Gets Drier, Wet Gets Wetter"? A Study over the Arid Region of Central Asia

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The "dry gets drier, wet gets wetter" (DGDWGW) paradigm is widely accepted over the global ocean, whereas it is controversial over the global land. As the key area of the Silk Road, the arid region of Central Asia is sensitive and vulnerable to climate variations. The assessments of dry and wet variations over this region plays a significant role on the ecosystems and human societies. To avoid the uncertainties of single-variable dataset, a number of multi-variable hydroclimatological datasets are applied to identify the wetting and drying trends over this region, including temperature, precipitation, potential evapotranspiration and drought indices. A significant warming trend is detected during the last century, especially during the last three decades with the trend of 0.36-0.42°C/decade. A seasonal warming shift with the largest increase in spring is founded. Among the reanalysis, spatially interpolated and satellite remotely sensed precipitation data sets, the spatially interpolated and remote sensed data sets have higher capability to represent the climatology of precipitation. A new method: Precipitation-Topography Partial Least Squares method (PTPLS) is proposed to incorporate certain terrain/geographic effects on precipitation in mapping the gridded data to the station locations for comparison with the observation. The five states of Central Asia (CAS5) have experienced a decreasing trend of the precipitation during 1951-2013, whereas an increasing trend is obtained in Xinjiang. Based on multi-variable drought indices as well as soil moisture, drying in CAS5 and wetting in northwest China (NW) are revealed. Moreover, the dry and wet variations are strongly correlated with the El Niño/Southern Oscillation (ENSO) with one-year lag, suggesting that the ENSO may have certain skills to forecasting the drought risks.

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