

8.区域地理系统演变与新质生产力的空间组织

Asymmetric responses of summer soil moisture anomalies to the large-scale teleconnections on the Loess Plateau between 2000 and 2020

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摘要: Soil moisture is a key regulator of hydrological cycle and is closely related to vegetation growth and climate changes, which is mainly replenished by summer precipitation on the Loess Plateau. However, the response of soil moisture content (SMC) anomalies during summer on the Loess Plateau to large-scale teleconnection remains unclear. Here, using the empirical orthogonal function (EOF) method, this study extracted a homogenized area with significant variability of normalized difference vegetation index (NDVI) ($p < 0.01$), which was called sensitive areas for vegetation restoration (SAVR) of the Loess Plateau. Based on 1 km daily soil moisture dataset named SMC11.0 at top 1 m, we demonstrated that there was an interannual fluctuation of summer SMC from 2000 to 2020 over the SAVR of the Loess Plateau. Spatially, SMC during summer in the SAVR of the Loess Plateau exhibited an enhanced regional difference characterized by ‘dry to drier and wet to wetter’. Importantly, abnormal SMC during summer in the SAVR of the Loess Plateau can be attributed to distinct circulation pattern and anomalous water vapor transport, which showed asymmetrical distributions between positive and negative anomalous years of summer SMC. Due to the activities of western Pacific subtropical high (WPSH) and low-pressure system around the Lake Baikal, the positive (negative) anomalous years of summer SMC witnessed net water vapor influx (outflux) anomalies to the Loess Plateau compared to the climatology, corresponding to anomalous upward (sinking) motions, further leading to more (less) SMC in summer over the SAVR of the Loess Plateau, respectively. The conclusions of this study have implications for excavating early warning information of SMC anomalies and natural restoration sustainable management on the Loess Plateau.

关键词: climate change; soil moisture content; remote sensing monitoring; teleconnections; Loess Plateau