



Thermal difference between the Tibetan Plateau and the plain east of Plateau and its influence on rainfall over China in the summer

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There exist thermal differences between the Tibetan Plateau (TP) and the plain east of the TP, and between land and sea in East Asia. The influence of the land-sea thermal contrast on the precipitation in East China has been widely investigated; however, a few studies have paid attention to the role of the TP-plain thermal difference. The major objective of the present work is to examine the influence of the TP-plain thermal difference. Firstly, we analyzed the features of the variability of the TP-plain thermal difference in the period of 1951–2007 using the NCEP data; secondly, we defined an index of the TP-plain temperature difference to discuss its relationship with general circulation and precipitation; finally, we simulated the probable process by use of a numerical model. Results show that: (1) In the summer, along the latitudes (27.5°-40°N) wherein the main part of the TP is situated, the TP is a warm center, and the regions from east of the TP to the West Pacific are cool areas. The boundary between the two areas is along 100°-110°E. The area-mean temperature difference between (27.5°-40°N, 80°-100°E) and (27.5°-40°N, 110°-120°E) at 500 hPa is defined as an index (dex_{T-C}), which approximately represents the TP-plain thermal difference. Analyses suggest that there is a remarkable connection between the TP-plain temperature difference and the summer rainfall in West China; (2) Variation in summer rainfall in southern West China (90°-110°E) is opposite to that in northern West China. Specifically, the opposite correlation is remarkable between the northeastern and the southeastern TP. In the last 57 years (1951-2007), the precipitation pattern in the West China (90°-110°E) had changed from “northern flood and southern drought” to “southern flood and northern drought”, which is closely connected with the interdecadal variation of the dex_{T-C} . (3) In the years of high dex_{T-C} , the thermal low over the TP and the high pressure ridge near Lake Baikal strengthened; the NPSH shifts southward than the normal; and the abnormal divergence low flows over the northeastern TP and abnormal convergence flows over the southeastern TP, which are beneficial to the appearance of southern flood and northern drought in West China (90°-110°E). In the low dex_{T-C} years, the anomalous distributions of rainfall and circulation are opposite to those in high dex_{T-C} years.

Key words: Tibetan Plateau, plain, thermal difference, inter-decadal change of rainfall, summer monsoon