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[JWARP](#) > Vol.2 No.6, June 2010



Relationship between Reduction of Summer Precipitation in North China and Atmospheric Circulation Anomalies

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Author(s)

Lisheng Hao, Jinzhong Min, Yihui Ding, Ji Wang

ABSTRACT

Based on Reanalysis datasets from National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) and summer rainfall datasets from China National Climate Center (NCC), by using trend analysis and composite analysis methods, the relationship between the reduction of summer precipitation in North China and northern hemispheric circulation changes was investigated. The results show that summer rainfall in North China had a significant decreasing tendency, especially true since 1965 in which an abrupt change occurred. The northern hemisphere atmospheric circulation at 500 hPa had a remarkable change after 1965, from outstanding meridional circulation to outstanding zonal circulation, leading to upper trough activity to decrease, resulting in the rainfall weather processes caused by upward motion behind trough significantly to reduce. At 500 hPa in Mongolian region, air temperature decreased, resulting in lower troposphere pressure to increase, leading to low pressure activity significantly to decrease and rainfall weather processes influencing North China to reduce. At the same time, the decreased air temperature in 500 hPa would caused the upper troposphere geopotential height to reduce, resulting in high– altitude jet southerly location, the East Asian summer monsoon to weaken, then it was difficult for water vapor transport to cross the Yangtze River valley and reach the North China region, with a southerly summer monsoon rainfall zone. The summer precipitation reduction in North China had a good correlation with the northern hemispheric circulation changes.

KEYWORDS

North China, Summer Precipitation, Reduction, Atmospheric Circulation, Anomalies

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