

Influence of the Meridional Position of the East Asian Subtropical Jet on Midsummer Precipitation in Eastern Northwest China (Postprint)

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Abstract

Based on daily precipitation data from 179 meteorological stations compiled by the National Meteorological Information Center of China and NCEP/NCAR monthly reanalysis data, this study analyzes the characteristics of midsummer (July and August) precipitation variation in eastern Northwest China from 1979 to 2017. Utilizing the East Asian subtropical westerly jet meridional position index, it specifically examines the relationship between meridional position variations of the East Asian subtropical westerly jet and midsummer precipitation in eastern Northwest China, aiming to further improve prediction capabilities for drought and flood disasters in Northwest China. The results show that in years when the meridional position of the East Asian subtropical westerly jet core is anomalously northward, midsummer precipitation in the northern part of eastern Northwest China is above the climatological mean, while precipitation in the southern part of eastern Northwest China is below the climatological mean, and vice versa. This exhibits a north-south dipole pattern in the influence of East Asian subtropical westerly jet meridional position variation on midsummer precipitation in eastern Northwest China.

Full Text

Effect of Meridional Position of East Asian Subtropical Jet on Midsummer Precipitation in Eastern Part of Northwest China

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Abstract:

Numerous studies have demonstrated that the East Asian subtropical westerly jet is closely related to summer precipitation across most regions of China, yet relatively few investigations have focused on Northwest China. This study utilizes daily precipitation data from 179 meteorological stations in China, compiled by the National Meteorological Information Center, along with monthly NCEP/NCAR reanalysis data to analyze variations in midsummer precipitation (July–August) in the eastern part of Northwest China from 1979 to 2017. Based on the East Asian subtropical westerly jet meridional position index, we examine the relationship between changes in the jet’s meridional position and midsummer precipitation in the region. The objective is to enhance predictive capabilities for drought and flood disasters in Northwest China. Results indicate that precipitation in the northeastern part of Northwest China tends to be higher during anomalous years when the East Asian subtropical westerly jet core is displaced northward, and lower when it is positioned southward. This demonstrates that meridional shifts in the subtropical westerly jet significantly influence midsummer precipitation variability in the eastern part of Northwest China.

Keywords: midsummer precipitation; climate change; East Asian subtropical jet meridional position; eastern part of Northwest China

The analysis focuses on the eastern part of Northwest China (approximately 35°–40°N, 95°–111°E). During years with a northward-shifted jet position, such as 1994, 1997, 2000, 2006, 2013, 2016, and 2017, precipitation in the northeastern part of Northwest China tends to be above normal. Conversely, during years with a southward-shifted jet, including 1980, 1987, 1993, 1998, 2004, and 2008, precipitation is generally below normal. These relationships are statistically significant at the 90% confidence level.

[Figure 2: see original paper] The normalized anomaly of meridional position index of interannual midsummer East Asian subtropical westerly jet during 1979–2017.

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