

## Long-term Regional Precipitation Disparity in Northwestern China and Its Driving Forces

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Precipitation in Northwestern China (NW China) is characterized by salient regional differences. Yet, the long-term regional precipitation disparity in NW China still remains insufficiently-explored. In the present study, we base on historical documentation to derive the fine-grained precipitation indices of two macro regions in NW China between AD580 and 1979 to (1) determine the multi-decadal to centennial regional precipitation disparity in NW China; and (2) find the major driving forces behind it. Wavelet analysis is applied. Our results show that there is significant regional discrepancy of precipitation change in NW China over extended period. Besides, the association between the regional precipitation disparity in NW China and various modes of atmospheric circulation (Asian Summer Monsoon, Arctic Oscillation, Pacific Decadal Oscillation, and North Atlantic Oscillation) is significant and characterized by a regime shift during the transition from the warm episode to the Little Ice Age in the 14<sup>th</sup> century. Most importantly, the ~180 to 240 year cycle of the El Niño-Southern Oscillation is found to be the most prominent pacemaker of regional precipitation disparity in NW China at the long-term temporal scales. Our findings help to demonstrate which atmospheric circulation is primarily responsible for the long-term regional precipitation disparity in NW China, which may have important implications for water resource management there.

Keywords: precipitation, moisture, atmospheric circulations, Asian Summer Monsoon, El Niño-Southern Oscillation, Northwestern China