

How did North Atlantic Oscillation (NAO) cause drought in northwestern China at the multi-decadal to centennial scales?

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North Atlantic Oscillation (NAO) plays an important role in the Northern Hemisphere climate system. Although there is growing interest in the connection between NAO and precipitation change in China, there are few studies concerning that connection in northwestern China. Based on fine-grained historical drought disaster records and NAO proxies, we explored quantitatively their possible connection in northwestern China over the past millennium at the multi-decadal to centennial timescales. Statistical results show that NAO and drought disaster were negatively correlated, as positive modes of NAO caused northward-displaced, stronger-than average mid-latitude Westerlies with an enhanced latitudinal water vapor gradient into the central Asian drylands, resulting in reduced drought frequency and intensity in northwestern China. But, their correlation was out-of-phase during the Little Ice Age because of the southward shifting of monsoon, Westerlies, and the East Asian Jet Stream brought by long-term land surface cooling. As it has been indicated that the precipitation in northwestern China is also determined by El Nino-Southern Oscillation and North Atlantic sea surface and air temperature aside from NAO, further studies are needed to evaluate their individual roles and combined impacts upon the drought disaster there.

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