

Reconstruction of past precipitation in northwestern china by use of historical records and APHRODITE datasets

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A group of official reports were found from archives of Qing dynasty (1694-1911) in The First Historical Archives of China. They included daily data of depths of wet-fronts observed after precipitation events. The reports were made by city governor-generals and governors under the command of the Qing Emperor. If these depths could be successfully converted, precipitation pattern of more than 80 cities can be reconstructed for the period of nearly 200 years in the 18th and 19th century.

For validating relation between depths of wet-fronts and amount of precipitation, a set of artificial precipitation tests were conducted in 6 different locations in the Heihe River Basin in the northwestern China in 2008. A simple relation was found between precipitation depths and depths of wet-fronts across different types of light textured soils (except for crust-forming soils) when antecedent soil moisture was low. Under these conditions, apparent wet-front depths did not change largely even 12 hours after the precipitation event, proving the robustness of the ancient observation method. For the case of successive precipitation events with high antecedent soil moisture, wet-front development was more dependent on a preceding condition.

The reconstructed past precipitation data were then compared to present daily precipitation datasets provided by APHRODITE. Reliability of reconstructed past precipitation was low for high time-resolution analysis due to inconsistency of measurements. Mean monthly precipitation calculated from reconstructed data (1749-1849) was higher than mean monthly precipitation of the present years (1980-2004) in majority of cities.

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