

The Spatial-temporal Variation of Precipitation and Temperature in Xinjiang in Recent 50 Years

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Background and Motivation: Because of its unique geographical conditions (far from the ocean, deep in the inland, surrounded by mountains), Xinjiang has formed a distinct temperate continental climate, which has the characteristics of dryness, less rain and strong evaporation. 26% of the territory is covered by desert, which belongs to a typical resource-based water shortage area and is extremely sensitive to climate change. Precipitation and temperature, as the key factors to characterize climate change, are the most obvious meteorological indicators to reveal regional climate change. Studying its changing trend is not only of great value to water resources allocation, drought and flood warning, agricultural vulnerability assessment in Xinjiang, but also of great significance to social and economic development and ecological environment protection in Xinjiang.

Abstract:

Research purpose: To master the spatial-temporal evolution of precipitation and temperature in Xinjiang, and to provide reference for industrial, agricultural and transportation industries in the study area.

Date and Rresearch methods: Based on monthly precipitation and temperature data of 64 weather stations in Xinjiang in recent 50 years, the spatial-temporal variation of precipitation and temperature were analyzed by the methods of simple linear regression, 5-year moving average, radial basis function interpolation, sliding -t test, accumulated variance analysis, Mann-Kendall and morlet wavelet transform.

Research conclusion:

(1) The annual average precipitation(8.65 mm/10a) in Xinjiang showed a significant increasing trend, and the increasing trend in local areas was:Northern Xinjiang(14.83 mm/10a) > Southern Xinjiang(7.76 mm/10a) > Eastern Xinjiang(3.37 mm/10a).

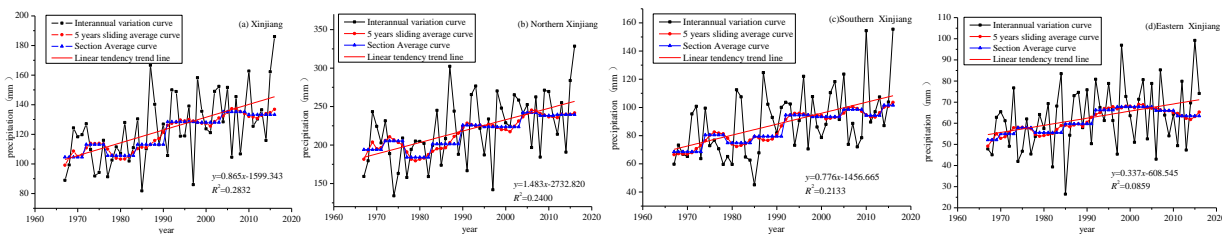


Fig.1 Annual average precipitation in Xinjiang and local areas

(2) The spatial distribution of tendency rate of annual precipitation is basically the same as the spring, summer and autumn in Xinjiang, the tendency rate decreases from northwest to southeast, but the tendency rate of winter precipitation decreases from north to south.

Table.1 Linear tendency rate of annual and seasonal average precipitation in Xinjiang(mm/10a)

Area	Year	Spring	Summer	Autumn	Winter
Xinjiang	8.65	1.75	3.34	1.87	1.69
Northern Xinjiang	14.83	2.97	5.09	2.75	4.02
Southern Xinjiang	7.76	1.14	3.88	2.07	0.67
Eastern Xinjiang	3.37	1.16	1.06	0.79	0.36

(3) The precipitation of Xinjiang changed abruptly in 1989, Southern Xinjiang was relatively earlier (1986), Northern Xinjiang (1991) and Eastern Xinjiang (1990) were relatively delay.

Table. 2 Years when the jump of annual and seasonal average precipitation occurred in Xinjiang and local areas

Area	The mutation year of average precipitation				
	Year	Spring	Summer	Autumn	Winter
Xinjiang	1989	1987	1990	1986	1995
Northern Xinjiang	1991	1997	1990	—	1991
Southern Xinjiang	1986	1984	1986 (1995)	—	1978、2001
Eastern Xinjiang	1990	1986	—	1976	1979、1997

Note: The bracket's value in the table is the mutation year by the method of Mann-Kendall, "—" is not obvious for the mutation year.

(4) The main cycle of precipitation was 26-30a in Xinjiang and local areas, which predicts that the next 10 years will be a wet season .

(5) The annual average temperature(0.44 °C / 10a) in Xinjiang is very significant, and the temperature increase trend in local areas is: Eastern Xinjiang(0.58°C / 10a) > Northern Xinjiang(0.45 °C / 10a) > Southern Xinjiang(0.31 °C mm/10a).

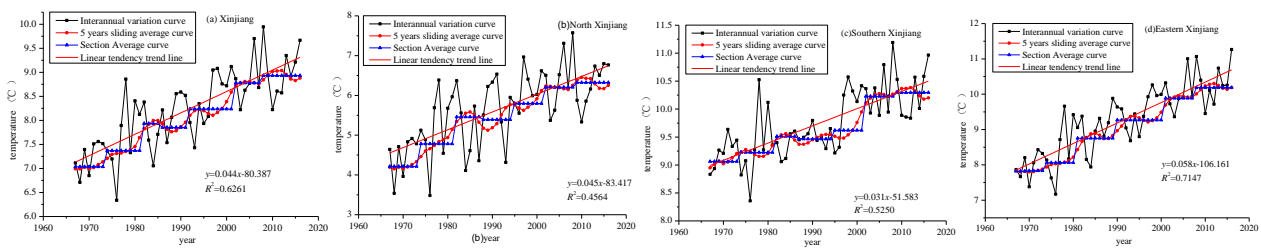


Fig.2 Annual average temperature in Xinjiang and local areas

(6) The spatial distribution of tendency rate of annual average temperature is basically the same as the four seasons in Xinjiang, and the tendency rate showed a decreasing trend from northeast to southwest.

Table.3 Linear tendency rate of annual and seasonal average temperature in Xinjiang(°C/10a)

Area	Year	Spring	Summer	Autumn	Winter
Xinjiang	0.44	0.48	0.36	0.44	0.50
Northern Xinjiang	0.45	0.52	0.3	0.44	0.52
Southern Xinjiang	0.31	0.31	0.22	0.31	0.4
Eastern Xinjiang	0.58	0.6	0.55	0.58	0.59

(7) The temperature change of Xinjiang occurred in 1988, Northern Xinjiang was 1988 (relatively earlier) , Southern Xinjiang and Eastern Xinjiang were 1992 (relatively delay) .

Table. 4 Years when the jump of annual and seasonal average temperature occurred in Xinjiang and local areas

Area	The mutation year of average temperature				
	Year	Spring	Summer	Autumn	Winter
Xinjiang	1989	1999	1997	1987	1980
Northern Xinjiang	1988	2003	1996	1987	1984
Southern Xinjiang	1992	2003	1997	1993	1985
Eastern Xinjiang	1992	1996	1996	1988	1980

(8) The main cycle of temperature in Xinjiang and local areas was 25-30a. It was predicted that the next 10 years would be high temperature period.

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