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Drought in Beijing, 1992-93

Zhuang Xie

Beijing Meteorological Bureau, Beijing, China

Dagang Chen

Beijing Meteorological Bureau, Beijing, China

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Zhuang Xie and Dagang Chen
Beijing Meteorological Bureau
Beijing, China

Precipitation

Beijing, located in northeast China, has a semiarid monsoon climate, with summer rainfall providing about 70% of the annual precipitation. This climate is conducive to crop growth, although insufficient summer rainfall in 1992–93 caused reductions in crop yields. Normalized departures of monthly precipitation ($\Delta R/R\%$) are shown in Figure 1. Although some months show above-normal precipitation (for example, November 1992, with a rainfall amount [43.3 mm] 7.5 times the normal), rainfall for the 1993 growing period was marked by negative departures from normal. Of the months of the 1993 growing season, only July recorded above-normal rainfall. Precipitation departures in May, September, and October 1993 were greater than 50%; as a result, summer corn did not germinate in some mountain areas, and it was difficult to seed winter wheat. Corn and wheat yields, in turn, were reduced.

Relationship between Precipitation and Temperature

Temperature departures for Beijing in 1992–93 are shown in Figure 2. In general, temperatures were above normal during the winter; summer temperatures ranged from slightly above to slightly below normal. Beijing's

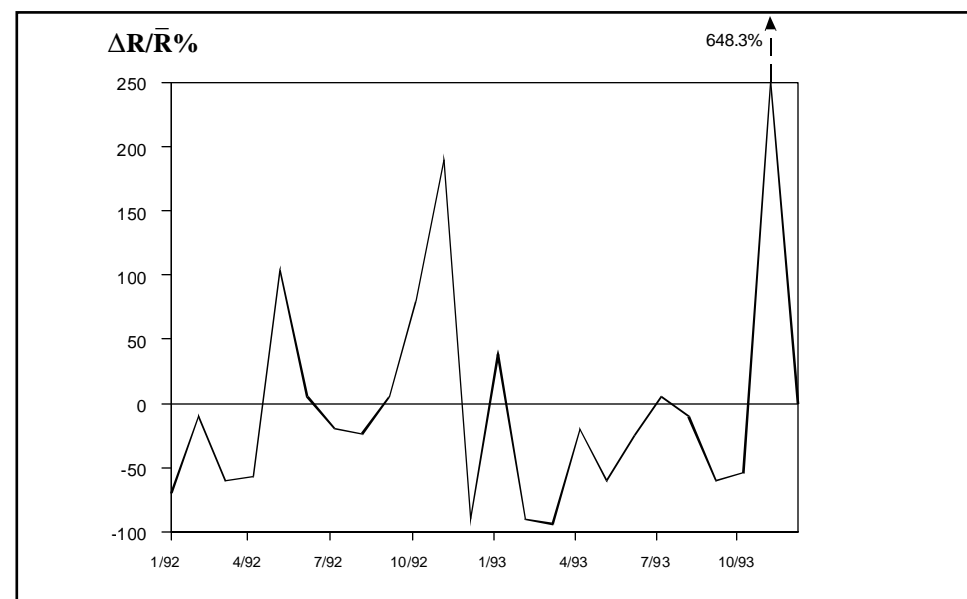


Figure 1. Normalized precipitation departures in Beijing, 1992–93.

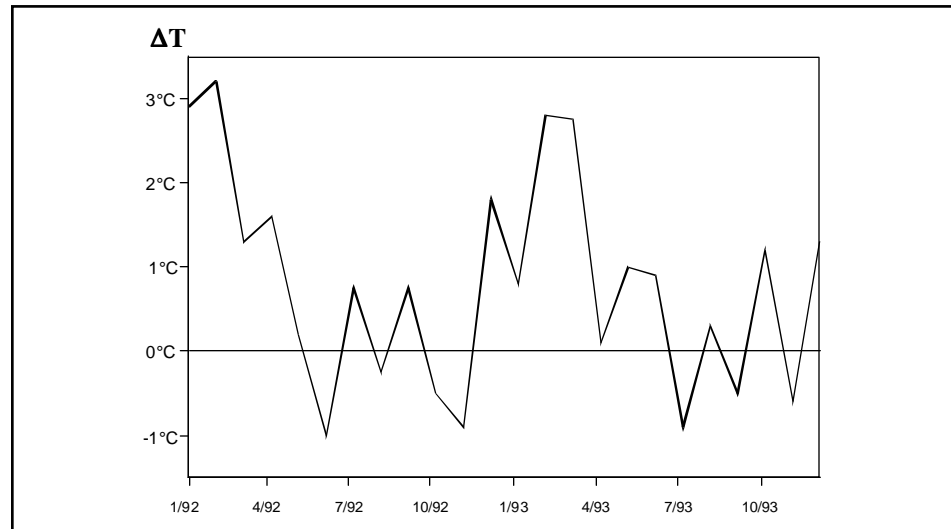


Figure 2. Temperature departures in Beijing, 1992–93.

eighth continuously warm winter since 1986 occurred during December 1992–February 1993. During the growing season, however, temperatures were lower than usual. Temperatures during June 1992 and July 1993, for example, were nearly 1°C lower than the normals for Beijing for these months, and the plant growing period was delayed about 10 days. The lower temperature trend during the summer also resulted in reduced crop yields.

Climatic Time Series

Beijing's observation data set, which dates back to 1840, is one of the oldest such data sets in China. Annual normalized precipitation departures ($\Delta R/R\%$) for Beijing for 1840–1989 are shown in Figure 3. The bar shows the annual precipitation departure and the curve shows the results of a smoothing filter (shown by bars). Two wet periods (1890s and 1950s) and three dry periods (1860s, 1940s, and 1980s) are shown. Normalized precipitation departures for the last 40 years show a continual decrease. The annual temperature departure profile for Beijing for 1860–1989 is shown in Figure 4; this profile shows a cold temperature trend until the 1920s, then an alternation of warm and cold periods, with a general warming trend for the past 40 years. The 10-year normalized annual precipitation departures and annual temperature departures (1870s–1980s) are shown in Figure 5. Generally, the 10-year temperature and precipitation departures are out of phase.

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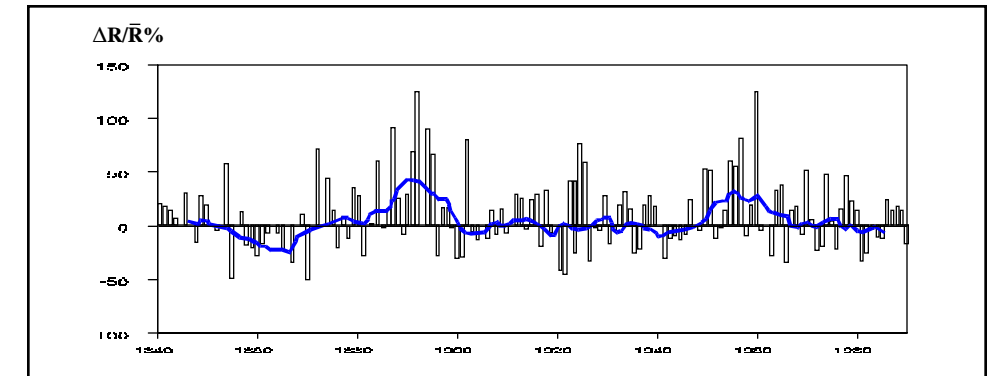


Figure 3. Normalized precipitation departures in Beijing, 1840–1990.

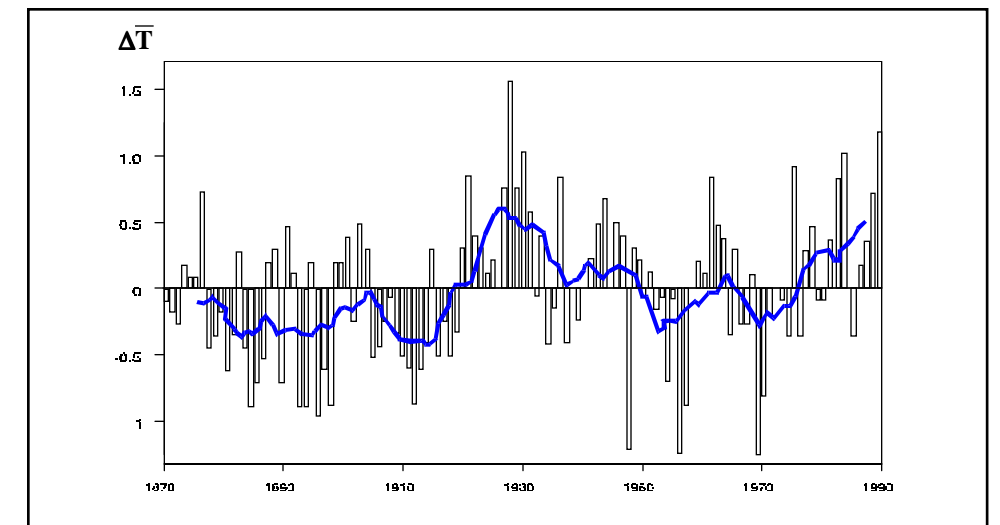


Figure 4. Temperature departures in Beijing, 1870–1990.

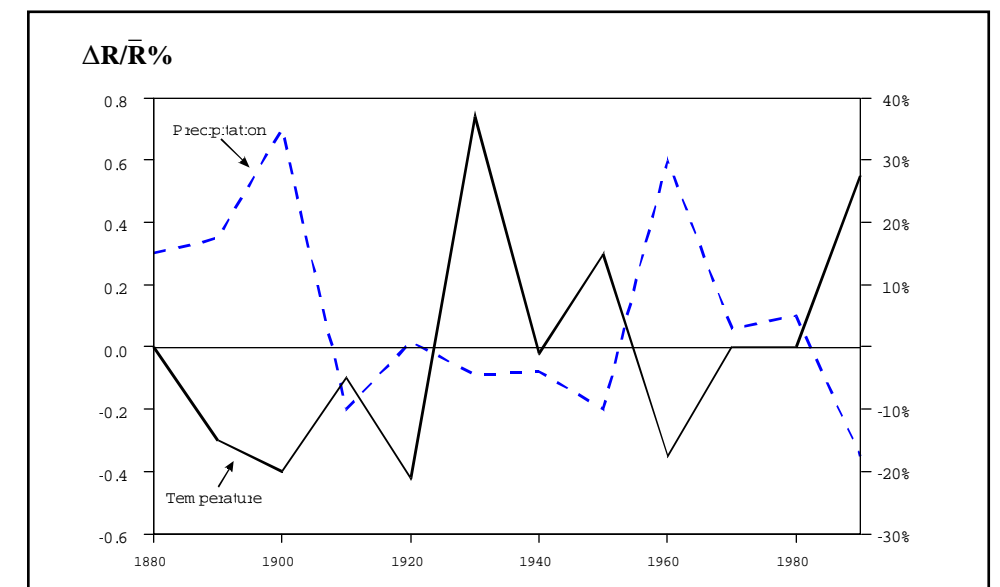


Figure 5. Ten-year departures of temperature and normalized precipitation.