



Climatic and Hydrological Changes of Past 100 Years in Asian Arid Zone

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The Asian Arid Zone (AAZ) is here defined to include the following regions: northwestern China, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. Generally speaking, the AAZ has experienced a temperature rising during the past 100 years that was significantly faster than the global average (0.14 °C per decade). Specifically, the rate was 0.39 °C per decade in northwestern China (1950–2010), 0.26 °C per decade in Kazakhstan (1936–2005), 0.22 °C per decade in Mongolia (1940–2010), 0.29 °C per decade in Uzbekistan (1950–2005), 0.18 °C per decade in Turkmenistan (1961–1995). It should be noted that the mountainous parts of AAZ seems to have experienced a slower rate of temperature rising. For example, the rate was 0.10 °C per decade in Tajikistan (1940–2005) and was 0.08 °C per decade in Kyrgyzstan (1890–2005). Precipitation has a slight increasing trend in northwestern China, but it has fluctuated along a near-constant line in the rest of the AAZ. Hydrological data from high-elevation basin show that the runoff has been increasing primarily as a result of rising temperature that caused increases in ice melting. A natural decreasing trend of surface runoff in low-elevation basins is undeniable and the decreasing trend is attributable to intensified evaporation under warming conditions. It is true that the total amount of runoff in the Tianshan Mountains and the associated basins has been increased primarily as a result of temperature rising-resulted increases in ice melting. But, approaching to the turning point of glacier-melting supplies to runoff will pose a great threat to socio-economic sustainability and to ecological security. The turning point refers to the transition from increasing runoff to decreasing runoff within ice melting supplied watersheds under a warming climate.