
Human-induced rainfall reduction in drought-prone northern Central Asia

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Abstract

The reduction of summer rainfall since the 1950s has resulted in severe drought and the degradation of vegetation over northern Central Asia (NCA). However, whether the decline trend of summer rainfall is anthropogenic or natural remains unknown. Here, we show evidences that the drying trend is dominated by anthropogenic change of the subtropical westerly jet (SWJ; referring exclusively to the active center located over Central Asia). Using 10 global climate models participating in the Detection and Attribution Model Inter-comparison Project (DAMIP) under different forcings, we find that the observed changes in the SWJ are attributable to the combined contributions of greenhouse gases and anthropogenic aerosols. Enhanced emissions of greenhouse gases favor an equatorial shift of the SWJ, while increased Asian pollution and reduced European aerosol emissions weaken the SWJ. Both of these factors strengthen the descending motion and decrease the precipitation over NCA.

Keywords: detection and attribution, internal variability, external forcing, precipitation

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