

The concurrent effects of the South Asian monsoon and Tibetan plateau monsoon on summer rainfall in Tarim Basin of China

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Based on the observed rainfall data at 34 stations over the Tarim Basin (TB) and the NCEP–NCAR reanalysis data during 1961–2012, the concurrent effects of the plateau monsoon (PM) over the Tibetan Plateau and the South Asian monsoon (SAM) on summer rainfall over the TB are investigated. Mid-upper tropospheric temperature (500–200 hPa) (MUTT) plays an important role in linking the PM and the SAM with summer rainfall over the TB. The concurrent influential mechanisms of the PM and the SAM on summer rainfall over the TB can be summarized as follows. The strengthened (weakened) PM and the weakened (strengthened) SAM causes mid-upper tropospheric cooling (warming), which tends to result in the migration of the subtropical westerly jet further southward (northward). Then an anomalous southerly (northerly) flow prevails over the TB, and more (less) water vapor is transported into the TB by a two-step process. All above contribute significantly to an increase (decrease) in the occurrence of summer rainfall over the TB. In addition, we also discuss the relative contribution of the PM and the SAM to summer rainfall over the TB. Partial correlations show that the PM and the SAM can both individually influence summer rainfall over the TB. The PM has a direct effect on summer rainfall over the TB, for its considerable relations not only with MUTT but also with atmospheric circulation. But the SAM has an indirect effect, because it can influence only MUTT, which then gives rise to an anomalous circulation related to summer rainfall over the TB.

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