

A new classification of large-scale climate regimes around the Tibetan Plateau based on seasonal circulation patterns

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Abstract

This study aims to develop a large-scale climate classification to investigate the characteristics of the climate regimes around the Tibetan Plateau based on seasonal precipitation, moisture transport and moisture divergence using in situ observations and ERA40 reanalysis data. The results indicate that the climate can be attributed to four regimes around the Plateau. They situate in East Asia, South Asia, Central Asia and the semi-arid zone in northern Central Asia throughout the dryland of northwestern China, in addition to the Köppen climate classification. There are different collocations of seasonal temperature and precipitation: 1) in phase for the East and South Asia monsoon regimes, 2) anti-phase for the Central Asia regime, 3) out-of-phase for the westerly regime. The seasonal precipitation concentrations are coupled with moisture divergence, i.e., moisture convergence coincides with the Asian monsoon zone and divergence appears over the Mediterranean-like arid climate region and westerly controlled area in the warm season, while it reverses course in the cold season. In addition, moisture divergence is associated with meridional moisture transport. The northward/southward moisture transport corresponds to moisture convergence/divergence, indicating that the wet and dry seasons are, to a great extent, dominated by meridional moisture transport in these regions. The climate mean southward transport results in the dry-cold season of the Asian monsoon zone and the dry-warm season, leading to desertification or land degradation in Central Asia and the westerly regime zone. The mean-wind moisture transport (MMT) is the major contributor to total moisture transport, while persistent northward transient eddy

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