

Article

Interannual variation of summertime precipitation over the Qilian Mountains in Northwest China

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Abstract

To better understand the time-space structure of the interannual variation of precipitation in the summer time, hereafter meaning June to August (JJA), in the Qilian Mountain region, an empirical orthogonal function (EOF) analysis is applied to the summertime precipitation times for 41 years (1961–2001) over there. The atmospheric circulation field, the moisture transport and the precipitation patterns associated with the dominant mode is shown by using European Centre for Medium-range Weather Forecast (ECMWF) reanalysis (ERA40, 1.125 degree grid) dataset and a new precipitation dataset which expresses an orographic enhancement of precipitation.

The first mode of the analysis, which explained 24.8% of the total precipitation variance, had a single mode centered along the Hexi Corridor region of this mountainous region with a weak increasing trend of precipitation. The second mode, which explained 15.8% of the total variance, had a dipole structure between the Hexi Corridor (north of 38°N) and the region south of this corridor. This mode was correlated with the Indian Summer Monsoon Rainfall (IMR), and the northern part of the Qilian Mountains had a negative correlation to IMR. The third mode had a dipole structure between the Tibetan Plateau area and the northern desert area. The westerly circulation anomaly was the dominant factor to define the wet (much precipitation) or dry (less precipitation) years around the Qilian Mountains. The second mode, which had a significant negative correlation with the IMR, was also related to the westerly circulation anomaly. In the southern part of the Qilian Mountains, a pressure anomaly around the western plateau area and the southwesterly moisture flux were also related to the interannual variation of the precipitation anomaly in this region.