Synoptic patterns that modulate the summer rainfall in northeast Mexico.

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Abstract

In northeastern Mexico has been recorded an increase in extreme rainfall for the period 1981-2010. Hence, the objective of this work is to find if there is a synoptic mechanism promoting these increments of events. For this, the self-organizing maps (SOMs) are used to relate large-scale patterns with the occurrence of extreme rainfall events for boreal summer (June to October) during the 1981-2020 period with the ERA5 dataset. The input variables used were sea level pressure, relative humidity at 850mb, vorticity at 925mb, and wind shear for the northeastern part of Mexico. We tested many configurations, choosing a rectangular 3x3 grid at the end, which captures the wide distribution of events that affect the region. Three nodes are related to extreme rainfall, with a weak Caribbean low-level jet (CLLJ) and Great plains low-level jet (GPLLJ), mainly in June, September, and October. By other hand, when the North Atlantic subtropical high (NASH) is strong, the CLLJ is intensified, and it reduced the probability of rainfall, which is known as mid-summer drought during July and August. One of the three rainy nodes has shown an increase in its occurrence. The next step is to analyze if these synoptic patterns have changed due to global warming.

Keywords: Extreme rainfall, SOMs, NASH, CLLJ, GPLLJ

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