



Sub-monthly variability of the Caribbean Low-Level Jet and its relationship to precipitation and atmospheric circulation in Mexico and Central America

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The climate of the region comprising Mexico, Central America and the adjacent ocean basins is controlled by a variety of regional and remote atmospheric and oceanic phenomena over multiple spatio-temporal scales. One of its dominant features is the Caribbean Low-Level Jet (CLLJ), a region of intense lower tropospheric zonal winds over the Caribbean Sea with two annual maxima in summer and winter.

In summer, during the region's rainy season, the variability of the CLLJ plays an essential role in determining moisture and precipitation patterns. In this work, by means of the extended Empirical Orthogonal Function (EEOF) analysis, we aim to understand the CLLJ spatial structure and evolution at sub-monthly (pentad) timescale, and its interactions with other important regional and remote features. The analysis is carried out by using a range of observational and remote-sensing datasets and atmospheric reanalyses.

The sub-monthly characterisation of the jet provides new dynamical insights which have been overlooked so far. When the jet reaches the Central America landmass it is split into two branches; a northward flow that crosses the Gulf of Mexico and controls rainfall distribution in southeast USA; and a westward branch that continues to flow mainly zonally through the eastern Pacific. The evolution of the northward branch is affected by the interaction of a thermal low over south-central USA and the North Atlantic Subtropical High. In contrast, the westward branch responds to SST differences between the Caribbean and the eastern Pacific. The variability of these two flows is found to be strongly related with variations of atmospheric pressure, surface temperature, vertical motion and precipitation patterns in the region of interest. Details of the underlying mechanisms are provided. These results help to advance the understanding of the mechanisms that modulate the climate variations in the region, which is an important issue in view of the rapid climate change the region is undergoing.