

Horizontal and vertical structure of easterly waves across Central America and Mexico

Yolande Serra
George Kiladis

Tropical easterly waves are most commonly associated with Atlantic and east Pacific hurricanes, whose origins the National Hurricane Center attributes primarily to easterly waves propagating off the coast of Africa. However, in addition to hurricanes, easterly waves also influence the summertime precipitation over the land areas surrounding the Caribbean Sea and Gulf of Mexico. There is also evidence to suggest that they influence precipitation patterns throughout the North American Monsoon region, including northern Mexico and the Southwest US. Thus, understanding the evolution of these waves as they pass over Central America and Mexico is critical for modeling summertime climate in many heavily populated areas and agricultural communities. In this study reanalyses are used to examine the coherence of the large-scale wave signature in vorticity, winds and streamfunction across this region. The temperature and moisture signals associated with the waves are also examined. These results are compared with local wave signals in winds, temperature and moisture observed at historic radiosonde locations throughout the region and archived at the Integrated Global Radiosonde Archive (IGRA).

Regression analyses suggest that easterly waves reduce in horizontal scale as they enter the Caribbean Sea/Gulf of Mexico region. Twin vortices form on either side of the mountains of Central America and Mexico of even smaller scale and propagate northwestward along both the east and west coasts, while the larger scale wave pattern reestablishes itself and propagates westward along approximately 10°N into the east Pacific. IGRA sounding data support these results observed in the reanalyses. Strong convective signals remain coupled to the vortices that spin off of the wave troughs and are likely the mechanism by which easterly waves influence precipitation patterns throughout Mexico and into the Southwest US. Future work will explore the energetics and precipitation features of the cutoff vortices over land using a regional model.