The Contribution of Eastern North Pacific Tropical Cyclones to the Warm Season Rainfall Climatology of the Southwest United States

Kristen L. Corbosiero
University of California, Los Angeles
Los Angeles, California

Michael Dickenson
Accurate Environmental Forecasting, Inc.,
Narragansett, Rhode Island

Lance Bosart
University at Albany, State University of New York
Albany, New York

Unlike the much larger and stronger Asian Monsoon, no single rainfall mechanism has been found to dominate the North American monsoon system. Surges of low-level moisture from the Gulf of California into the southwestern United States (US) account for a significant part of the intraseasonal variation of monsoon rainfall. These suerges have been found to be associated with the passage of tropical easterly waves and tropical cyclones (TCs) near the southern end of the Gulf of California. As the eastern North Pacific is climatologically the most active basin for TC development, the question is raised whether eastern North Pacific TCs themselves play a significant role in the summer rainfall climatology of the southwest US. The present study seeks to address this question using high resolution, daily rainfall, and best track TC data for the summer months of the years 1958 to 2003.

Thirty-five TCs and their remnants were found to bring significant rainfall to the southwest US in the 46 years studies, representing just 6% of the total number of TCs that formed within the eastern Pacific. The first two weeks of September were the most common time for TC rainfall in the monsoon region. Averaged over all TC rainfall events, ~15% of the monsoon seasonal rainfall is contributed by TCs, with individual storms account for as much as 95% of the summer rainfall experienced in the region. The distribution of rainfall in these events reveals two dominant tracts of storms from the eastern Pacific into the monsoon region, one directly north into southern California and the other cutting northeastward from southwestern Arizona through extreme northwestern New Mexico and into southwestern Colorado.

Preliminary results indicate that TCs are twice as likely to influence the southwest in years that are climatologically dry, underscoring their importance to the summer rainfall in the region. TC rainfall is also twice as likely to occur during La Niña years. The large-scale flow patterns over the western US and eastern Pacific associated with these signals are currently being studied and will be explored in detail in the talk.

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