Factors Leading to Dominica's Extreme Precipitation from Tropical Storm Erika

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Tropical cyclones are generally characterized by strong rotating winds, and yet the associated rainfall can be even more destructive. Tropical Storm Erika (2015) is an example of such a cyclone whose heavy rainfall south of the storm center is responsible for significant loss of life and property. Erika was a weak tropical storm in a sheared environment that passed through the Lesser Antilles on August 27th of 2015. Rain gauges on the Commonwealth of Dominica measured almost 20 inches of rain in less than 12 hours. Understanding the factors leading to heavy rainfall on Dominica is important for future prediction of similar weak, sheared tropical storms passing near mountainous islands.

In this study, we use observations and the Weather Research and Forecasting (WRF) model to investigate the tropical storm structure and storm environment, the effect of Dominica's orography, and other aspects that played a role in the heavy precipitation. Preliminary results show that the large-scale vertical wind shear was a key factor in organizing convection southeast of the low-level center of circulation. However, other mesoscale factors were also influential, as both observations and the WRF simulations show channelling flow and convergence between Dominica and Martinique. WRF simulations with reduced terrain have reduced rainfall suggesting that interactions between the storm winds and Dominica's orography contributed to the heavy precipitation. Our results highlight the multi-scale interactions that can contribute to heavy precipitation associated with tropical cyclone passage near mountainous islands.