A Study of Predecessor Rainfall Events (PRE) in Advance of Tropical Cyclones

Matthew Cote
State University of New York, Albany, NY

Michael L. Jurewicz, Sr.
National Weather Service, Binghamton, NY

Recent tropical seasons in the Atlantic basin have been quite active. This has translated to an increased frequency of land falling tropical cyclones in the United States. In several instances, a concentrated area of heavy rainfall was observed well upstream from the land falling tropical system itself; separate from the cyclone's primary precipitation shield. In some of the more pronounced cases, severe flooding caused substantial human and economic impacts, including loss of life and significant structural damage. Since the primary focus was often on adverse conditions directly associated with the tropical cyclones, PRE have mostly been unexpected phenomena.

One of the goals of this study is to raise awareness of PRE in the meteorological community. Numerous data archives were investigated between the late 1970's and present in order to establish a relative frequency of their occurrence. From this research, a catalog of PRE and the tropical cyclones indirectly associated with them was formulated.

The ultimate objective of this work is to improve the ability of forecasters to predict PRE with more advanced notice. Individual PRE from the above mentioned database were studied so that atmospheric elements common to their occurrence, as well as temporal and spatial distances from the tropical cyclones indirectly linked to them, could be identified. Preliminary results indicate that areas which are upstream from the tropical cyclone itself, underneath the entrance region of an upper-tropospheric jet streak, and near a mid-tropospheric confluence zone are most susceptible to PRE. Since PRE do not occur every time a tropical cyclone either nears the United States or moves inland, a number of null cases were looked at. Early results seemed to key on the position and amplitude of the mid to upper-tropospheric trough north of the tropical cyclone. When the trough axis was either in a state of de-amplification, or had already moved to near or east of the longitude of the tropical cyclone, PRE typically did not occur. These types of comparisons will hopefully help forecasters become adept at recognizing large-scale patterns both favorable and unfavorable for PRE.

Possible future work includes a more detailed investigation of some of the smaller scale features associated with PRE (mesoscale banding, terrain influences, etc.). Also, PRE will continue to be studied, as they occur, to further our understanding of these phenomena.