Remote Heavy Rainfall from Tropical Cyclone

Fan, Chieh-Hsiang (School: The Affiliated Senior High School of National Taiwan Normal University)
Hsiao, Bo-Jhih (School: The Affiliated Senior High School of National Taiwan Normal University)

Tropical cyclones (TCs, or typhoons in the western North Pacific) typically produce heavy rainfall within approximately 200 km radius. Some TCs induce extreme rainfall in remote areas when they interact with other synoptic weather systems. In the case of TC Megi, the maximum accumulated rainfall was 940 mm/day (37 inches/day)in the northeast of Taiwan while TC Megi was still 700km away in the southwest of Taiwan. The goal of this work is to understand the mechanisms leading to a heavy rainfall event under the combined influences of the outer circulation of TC, the monsoon, and the topography of northeastern of Taiwan. Using the wind field analysis, infrared satellite images, and the hourly rainfall data from six stations, we studied the remote heavy rainfall in several TC cases. Our results are the following: (1) The large scale of convergence between TC circulation and the northeast monsoon causes the huge rainfall in northeast of Taiwan while TC was still far away. (2) Additional water vapor transported by both TC circulation and the northeast monsoon converges in the northeast and results in the heavy rainfall. (3) The topography in northeastern of Taiwan changes the local wind and further enhances the rainfall. As important as predicting the typical TC rainfall, our results highlight the pathway for the remote heavy rainfall, which involves the large-scale interaction, orographic effect in the local region. By understanding these mechanisms in delicate manners, it is hoped that we could develop a simple quantitative forecast for the purpose of the remote heavy rainfall disaster reduction.

Awards Won:
American Meteorological Society: Certificate of Honorable Mention