AOGS 2005

A Study on the Heavy Rainfall Event in Taiwan Associated with Typhoon Mindulle (2004) and the Accompanied Southwesterly Flow

C.-S. LEE[1], L.-Y. LIN[2], KEVIN K. W. CHEUNG[2], Y. -M. CHEN[2] and H.-C. KUO[1]

[1]*Department of Atmospheric Sciences, National Taiwan University*
[2]*National Science and Technology Center for Disaster Reduction, Taiwan*

The heavy rainfall event that occurred during 2–4 July 2004 in Taiwan associated with Typhoon Mindulle and the accompanied monsoonal southwesterly flow is diagnosed in this study using a range of observational data. Different dynamical factors were playing their role in each of the several rainfall periods. In the first period (30 June – 1 July) when Typhoon Mindulle was east of Taiwan, direct impact from the typhoon circulation brought rainfall to the eastern part of the Island. The second period (2 July) was when Mindulle's center stayed north of Taiwan. An east-west oriented convergence line formed between the dry northerlies (advected by the typhoon circulation from inland) and the warm, most southwesterlies. Following the northward motion of Mindulle, the convergence line and the convective cells embedded were also shifting northward, bringing heavy rainfall to the entire southwestern plain of Taiwan. In the third period (3–4 July), Typhoon Mindulle was further away from Taiwan and only the southwesterlies persisted in the area. The rainfall shifted to the north-south oriented central mountain range.

Four factors are identified to be essential determining the development of the entire rainfall event. These include the convergence between the southwesterly flow and Typhoon Mindulle's circulation, the warm and moist monsoonal southwesterly flow, the high-pressure system east of the Philippines, and Taiwan's orographic effect. The first three factors control the rainfall distribution during 2 July, while the orographic effect was dominating during 3–4 July. Based on these findings and comparison with some of the historical tropical cyclone-related rainfall cases in which strong southwesterlies also played important role, a conceptual model is built up for this kind of tropical cyclone-monsoon interaction. Examination of climatological data also confirms the role played by Typhoon Mindulle in the rainfall event.