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An Observational and Numerical Studies on Flooding Events Associated with the Southwesterly Flow After the Passage of Typhoon Mindulle

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Flooding is unusual in most of Taiwan during the monsoon break period. However, flash floods occurred in central and southern Taiwan on 2-4 July 2004 during the climatological minimum rainfall period (16 June to 15 July). This event was initialized by typhoon Mindulle and by mesoscale convective systems (MCSs) embedded in the southwesterly flow that followed the passage of the typhoon over Taiwan. The daily rainfall total on 1 July shows that more than 200 mm of rainfall amount was over eastern Taiwan where Mindulle was over east coast. On 2 July, more than 300 and 500 mm of total rainfall was observed over the central and southern parts of western Taiwan, respectively when Mindulle was over the northern coast . However, when the typhoon moved northward toward the East China Sea on 3 July, central and southwestern Taiwan suffered from more rainfall than on 2 July. This huge rainfall amount decreased on 5 July. Climatologically, there was a western Pacific subtropical high (WPSH) over Taiwan from the end of June to early July (Chen and Chen 2003). However, during the 1-5 July 2004 period, the mean synoptic pattern at 850 hPa-level showed that there was a nearly northwest-southeast orientated WPSH ridge was to the east of 130°E, and a monsoon trough that extended from South China Sea through Taiwan to the eastern China coast. Meanwhile, there was a northwesterly flow associated with Mindulle and a high pressure area over the slope of the Yuin-ku plateau in southeastern China. As a result, air with a high equivalent potential temperature over southern Taiwan Strait and the northern South China Sea, moved into the Taiwan area with helped promote rainfall over Taiwan. In this study, the preliminary results for the WRF model simulation of the heavy rainfall associated with the typhoon and the MCSs from 2-4 July 2004 initialized at 2000 LST 1 July 2004 will be presented. The mechanism result to produce the heavy rainfall and flooding will be discussed based on the observational analysis and diagnosis of simulation results. The performance of the WRF model and it's capability as a severe weather research tool in a subtropical area. will also be discussed.