

Revisiting a Mei-Yu Front Associated with Heavy Rainfall over Taiwan During 6–7 June 2003

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During 6–7 June 2003, a Mei-Yu jet/front system over southern China is characterized by appreciable horizontal temperature contrast below the 850-hPa level (> 8 K), where the cold, dry postfrontal northeasterlies converge with the warm, moist southwesterly flow, and above the 400-hPa level (> 18 K) associated with an upper-level front. The frontal baroclinic zone tilts northward with a slope of $\sim 1/100$. During the passage of a midlatitude trough, the upper-level jet/front system advances southeastward. The thermally direct circulation across the subsynoptic low-level jet (SLLJ)/Mei-Yu front system, coupled with dynamic forcing aloft on the equatorial side of the entrance region of a subsynoptic upper-level jet (SULJ), provides a favorable environment for the development of a frontal cyclone over southern China. A southwesterly marine boundary layer jet (MBLJ) develops between the deepening Mei-Yu frontal cyclone and the West Pacific Subtropical High (WPSH). The MBLJ transports from the northern South China Sea (NSCS) to southern China. All three jets (SULJ, SLLJ, and MBLJ) interact together during the deepening of the Mei-Yu frontal cyclone with positive feedback effects of latent heat release.

On 7 June 2003, as the Mei-Yu front arrives near the Taiwan area, the warm, moist, and unstable air associated with the MBLJ decelerates as it approaches the Central Mountain Range (CMR). The warm, moist, and unstable air is orographically and lifted by the CMR and enhances the vertical motion already present with the frontal zone. A region of widespread heavy rainfall develops, with a maximum of more than 350 mm/day, over a region extending from the southwestern coast of Taiwan to the windward slopes of the CMR.

Keywords: Mei-Yu front, Moisture transport, Heavy rainfall, Upper-level and low-level coupling, Orographic precipitation