

# Numerical Experiments Investigating the Mechanism of a Heavy Rainfall Event Over the Northwestern Coast of Taiwan During TAMEX IOP 13

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The mechanism for the development of an unusual heavy rainfall event ( $> 230$  mm day<sup>-1</sup>) that occurred over the northwest and central Taiwan coastal areas during TAMEX (Taiwan Area Mesoscale Experiment) IOP (Intensive Observing Period) #13 (24-25 June 1987) was investigated using the Pennsylvania State University/National Center for Atmospheric Research fifth-generation nonhydrostatic Mesoscale Model (MM5). The results show that in the evening of 24 June 1987, the convective activities were first simulated in the area of ascending motion over northern Taiwan Strait and to the south of a Mei-Yu frontal boundary. The Mei-Yu front's southward advance was retarded by the hilly terrain along the southeast China coast. In the mean time, a short wave trough moved over the Taiwan Strait. A barrier jet was simulated over the ocean just off the northwestern Taiwan coast due to the interaction of the southwesterly monsoon flow and Taiwan topography. The area with the maximum simulated rainwater then moved eastward toward the convergence area between the northwesterly wind behind the short-wave trough and the southerly barrier jet off the northwestern Taiwan coast. Consequently, the convection intensified into a northeast-southwest orientated rainband in the convergence zone near the western edge of the barrier jet in late night on 24 June. The eastward movement of short-wave trough in the late night on 24 June and early morning on 25 June caused the convergence zone and the rainband to move southeastward. The northern part of the rainband made landfall at 0200 LST. Heavy rainfall over northwestern coast commenced at 0300 LST. As the short-wave trough passed over Taiwan, northwesterly flow behind the 850- hPa trough moved southward. As a result, the southwesterly monsoon flow diminished over northwestern Taiwan and the barrier jet vanished. These results are in agreement with the observational study presented by Li et al. (1997). Model sensitivity tests confirmed that no barrier jet and no rainband formed over the ocean near northwest coast of Taiwan in the experiment without considering Taiwan's topography. Without Taiwan topography in the model, the simulated rainfall accumulation is much less and mainly along the east-west orientated shallow frontal boundary. No heavy rainfall was simulated over the northwestern-central coastal areas of Taiwan.