Effect of Low-level Jets on the Movement of the Mei-yu Front

Mu-Qun HUANG[1+], Pay-Liam LIN[1#], Chuan-Chi TU[1], Shuwei HSU[1], Yi-Leng CHEN[2,1]

[1]National Central University, Taiwan, *[2]University of Hawaii at Manoa, United States*

During Taiwan's Mei-Yu season, abundant moisture transported by low-level southwesterly monsoons frequently causes heavy rainfall events. On June 2, 2017, a Mei-Yu frontal case, influenced by favorable synoptic conditions and northern terrain blocking effects, produced 645.5 mm of accumulated precipitation in northern Taiwan. With barrier jets observed along Taiwan's western coast, this study employed numerical simulations and four sensitivity experiments to investigate how barrier jet intensity affects Mei-Yu frontal movement and precipitation distribution. The researchers designed sensitivity experiments including complete terrain removal, southern mountain terrain modification (half-height and complete removal), and barrier jet enhancement, while preserving northern Taiwan's complex topographic influence. Results revealed that enhanced barrier jets significantly impeded the southward movement of the Mei-Yu front, concentrating rainfall and increasing precipitation accumulation. Conversely, weakened barrier jets allowed rapid southward frontal propagation, dispersing rainfall areas and notably reducing accumulated precipitation. This study clearly demonstrates that barrier jets play a crucial role in modulating Mei-Yu frontal movement and the development of heavy rainfall events in northern Taiwan, which has significant implications for improving extreme precipitation forecasting capabilities in northern Taiwan.