THE INFLUENCE OF TERRAIN ON PRECIPITATION INTENSITY AND DURATION DURING THE JUNE 2017 TAIWAN HEAVY RAIN EVENT

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ABSTRACT

Extreme rainfall results from high intensity rain rates, long duration events, or a combination of both, leading to the generalization that the heaviest precipitation occurs where rainfall is the most intense for the longest period of time. Atmospheric ingredients that favor rainfall across this spectrum combine nonlinearly to produce the most extreme precipitation and the presence of mountainous terrain acts to induce vertical motion that can modify those ingredients. The overall goal of the upcoming PRECIP campaign in Taiwan and Japan is to explore the primary forcing mechanisms for extreme rainfall in a moisture-rich environment, with a focus of our team on how terrain interactions modify the magnitude and availability of the ingredients and processes leading to extreme rainfall.

Ahead of the PRECIP campaign, we use the precipitation intensity-duration framework to explore the role of terrain in a heavy rainfall event occurring in Taiwan during 1-3 June 2017. During this Mei-Yu event, over 600 mm fell over Taipei basin in 12 h, with areas in the western slopes of the Central Mountain Range exceeding CWB's extremely torrential warning criteria. Observations from the operational radar network and QPESUMS rainfall product show the highest rainfall intensities occurring at the lower elevations with the longest durations over the 48-h period occurring in the 1500-2000 m elevation range. A high-resolution WRF simulation largely captures the observed rainfall trends with respect to terrain and thus is used to conduct a terrain-modified experiment in which the mountains are reduced by 50%, resulting in lower intensity and duration over the terrain as well as influences on the timing of the Mei-Yu front. This presentation explores these differences in greater detail to examine the role of topography in this extreme rainfall event.

Keywords: intensity-duration framework, Mei-Yu, WRF, heavy rain, orographic precipitation