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Radar Observations of Orographically Enhanced Precipitation Embedded within Typhoons

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In Taiwan, heavy precipitation events occur mainly in warm season. It has been long recognized that the occurrence of these severe weather events is closely related to landfalling precipitation systems such as the Mei-yu fronts and typhoons. Although it is well known that interactions of complicated and steep terrain over Taiwan with these precipitation systems often result in the occurrence of local severe winds and floods, their specific processes and mechanisms have been largely unexplored and thus remain poorly understood. The primary objective of this study is to use the ground-based Doppler radar data to investigate the basic characteristics of orographic precipitation when the Taiwan area was significantly influenced by approaching typhoons.

In the view of observations, an unavoidable challenge in addressing scientific issues relevant to the orographic rains is to distinguish them from the precipitation that is associated with inherent typhoon rainbands. In this presentation, several observational events of orographically enhanced precipitation in the vicinity of typhoons (two selected examples are shown in Fig. 1), which were evidently identified and observed by radar observations, will be demonstrated to show how the orography modulated the precipitation embedded within the typhoon circulations and rainbands. Particularly, the temporal and spatial variations of precipitation relative to the terrain features and their possible relation to the environmental upstream flow will be focused.

Keywords: Mei-yu front; typhoon; orographic precipitation; Doppler radar

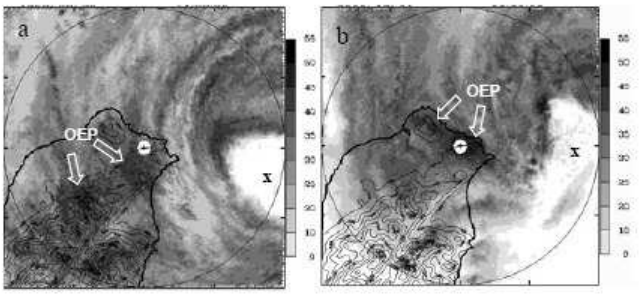

Figure 1: Low-level PPI scan (1.5o elevation) of radar reflectivity (dBZ, shading key to the right) from the Wu-Fen-San radar (location is marked by "+") at (a) 1122 LST 31 July 1996 (Typhoon Herb); (b) 0331 LST 1 November 2000 (Typhoon Xangsane). Terrain height (m MSL) is indicated by contours at 300-m intervals. In each panel, arrows highlight the positions of orographically enhanced precipitation (OEP). The letter "X" denotes the typhoon center and the large circle refers to the 90-km observational range of the Wu-Fen-San radar.