

A Diagnostic Case Study of Mei-yu Frontal Retreat near eastern Taiwan

(臺灣東部近海梅雨鋒面北退個案之分析診斷研究)

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Abstract

After advancing southward across Taiwan and becoming quasi-stationary, a mei-yu front moved north again and led to a second period of significant rainfall during 13-14 June 2012. Associated with this frontal retreat, a meso-scale low pressure developed to the southwest of Taiwan, in the proximity of organized mesoscale convective systems (MCSs) along and south of the front over the northern South China Sea. In this study, using mainly the European Center for Medium-Range Weather Forecasts gridded analyses, the physical mechanisms of this frontal retreat are investigated and diagnosed, with a focus on the initial retreat and the role played by the deepening frontal low.

The diagnoses employing the vorticity equation and frontogenetical function both indicate that the appearance of southerly winds, and thus the retrogression of cold air, north of the front was the cause of the initial frontal retreat, consistent with earlier studies. The potential vorticity diagnosis using piecewise inversion technique further confirms that the deepening low over the southern Taiwan Strait provided the southerly winds east of Taiwan where the retreat started, while the low itself intensified in response to the persistent latent heating by the active and organized MCSs. Thus, the northerly winds on the cold side of the front near Taiwan were replaced by southerly winds, and the mei-yu front in the present case retreated and essentially became a warm front. While mei-yu frontal retreats near Taiwan are more frequent than previously recognized, the present case was the most significant event in three seasons during 2012-2014.