

EGU2020-2500

<https://doi.org/10.5194/egusphere-egu2020-2500>

EGU General Assembly 2020

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A Case Study of Severe Precipitation Caused by Meiyu Front in Northwest Taiwan

Jou Ping Hou, Li Zhen Su, and Yi Hao Liao

NDUCCIT, Environmental Information and Engineering Dept., Taoyuan City, Taiwan (hoedwardho@gmail.com)

From May to June in Southeast Asia, the cold high pressure on the mainland gradually weakens and the Pacific high pressure gradually increases. These two cold and warm pressure systems will form confrontations near Taiwan and South China. The stable "front" system is called "Meiyu front" in Taiwan. In previous studies, when the Meiyu front passed, it had the opportunity to converge with the prevailing wind field in front of the terrain in the northwestern part of Taiwan, resulting in a fast-moving airflow and the intensity of the jet, which is usually concentrated in the lower layers. It is therefore called a low-level jet. Low-level jets under certain conditions, known as barrier jets, can cause severe rainfall in northern Taiwan when they occur. The results of this study show that in the early morning of June 2, 2017, the Meiyu front approached northern Taiwan. When the main body of the front moved toward the Snow Mountain Range in northern Taiwan, a barrier jet appeared at an altitude of about 1 km. After the emergence of the barrier jets, severe precipitation occurred in Keelung and the northern coast of Taiwan in just 12 hours. Our research found that the emergence of barrier jets resulted in the increase of temperature gradients and vertical velocities in local areas; horizontal vortex tubes were twisted in the vicinity, and the horizontal wind shear on both sides of the jets enhanced the cyclonic circulation above the jets. And through the non-adiabatic effect, the stability of the release part was caused, resulting in a severe precipitation event in northern Taiwan. In this study, the observation data and model simulation results are compared with each other to analyze the main cause and physical mechanism of the severe precipitation in the northwest region in this case, and then to infer the dynamic and thermal processes of such weather phenomena over time.