EGU22-6061, updated on 07 Aug 2022
https://doi.org/10.5194/egusphere-egu22-6061
EGU General Assembly 2022

Analysis on the influence of cold air intrusion to the formation of a Southest Vortex and rainstorm in China

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Synoptic analysis of a rainstorm occurred in Mianning, Sichuan, China started on June 26, 2020 is carried out in this study. During this event, the maximum observed precipitation occurred in Lingshansi station, reaching 181.9mm from 18:00 on June 26 to 02:00 on June 27, 2020(BJT) and resulting in a severe flood disaster. Through the analysis of various data (including FNL, ERA5, wind profile data), we found that a cold air flow gradually intrudes into the west of Sichuan Basin from north to south along the eastern edge of Qinghai-Tibet Plateau, during the process, a Southwest Vortex (A meso-ß vortex system often generated in Southwest China and prone to led heavy precipitation) gradually formed, and the precipitation in Mianning area occurred in the process of the formation of the Southwest Vortex. In order to determine whether the invasion of cold air into Sichuan Basin is the main factor triggering the generation of Southwest Vortex and rainstorm in this area with rough terrain, a series of numerical sensitivity experiments were carried out. The results show that the invasion of cold air plays an important role in the formation of the Southwest Vortex. The cold and warm air meet at the Anning river valley of Mianning and are forced to rise by terrain which leads to the strengthening of vertical circulation in the valley and the heavy rainstorm.