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Investigating Model Forecast Bias for Rainfall Produced by Slantwise Ascent above Cold High

Ning Hu and Jiaolan Fu

(National Meteorological Center of China Meteorological Administration, Beijing, huning425@126.com)

Moderate to heavy rain produced by slantwise ascent of moist air above the cold high is prevalent in cold season in East China. The slantwise ascent is usually characterized by a southwest moist flow aroused by the so-called southern branch trough of 500hPa level to the south of the Qinghai-Tibet Plateau, while the cold high is usually formed by cold air damming, which is familiar to weather forecasters due to topographic feature of East China. The routine short-range forecast skill for this kind of precipitation of weather forecasters is usually limited by model performance. Through large sample model verification, our study indicates that, for the rainfall produced by southwesterly moist flow ascending above the cold high, the ECMWF model always underestimates the rainfall amount on the northeastern part of the rainfall belt, which could be taken as a systematic bias of the state-of-the-art global model. Our case studies indicate that the underestimation of rainfall amount is related to the weaker slant ascent of moist southwest flow forecast by ECMWF model than observation or reanalysis. The southwest flow above the northeastern flow induced by the cold high forms strong wind shear and warm-moist advection, which favors the occurrence of conditional symmetric instability producing strong slantwise ascent not well reflected by global model.