Bias correction and downscaling of 1-14-day rainfall forecasts in Taiwan

Hui-Ling Chang[1], Yun-Jing Chen[1], Shih-Chun Chou[1], Chih-Yung Feng[2], Han-Fang Lin[2],

Jen-Her Chen[1], Meng-Shih Chen[1], Ting-Huai Chang[1]

[1]Central Weather Bureau, Taipei, Taiwan

[2]Manysplended Infotech Ltd

Abstract

Focusing on extended-range rainfall forecasts for reservoir watersheds, some statistical post-processing (SPP) techniques were used to perform bias correction and downscaling of rainfall forecasts. The purpose of this study is to provide more accurate and practical 2-week rainfall forecasts for the decision-making of the water-resource management.

Realistic complex terrain and correct local circulation are two critical factors in accurate rainfall forecasts in Taiwan. Limited by the simplified terrain of global model and the predictability of extended-range forecasts, calibration on both rainfall pattern and amount should be taken into account in 1-14-day rainfall forecasts. Therefore, first, extended logistic regression using large-scale indices as predictors was adopted to calibrate rainfall pattern and downscale rainfall from global model grids to stations. The reason we adopted the large-scale indices as the predictors is that the large-scale circulations have a teleconnection with the extended-range rainfall forecasts in Taiwan, and the predictability of the large-scale circulation is much higher than that of the local rainfall forecasts. Then, we used the Simple Kriging method to obtain high-resolution gridded rainfalls from station forecasts. Finally, the Frequency Matching Method (FMM) was applied in high-resolution gridded rainfall forecasts to calibrate rainfall amount. Forecast evaluations of rainfall cases in Mei-yu and typhoon seasons show that the calibrated and downscaled rainfall forecasts have a very significant improvement over the raw rainfall forecasts on the extended-range rainfall forecasts. Even for week-2 rainfall forecasts, the rainfall pattern and amount are quite similar to the ground truth.

Keywords: bias correction, downscaling, extended logistic regression, Simple Kriging, Frequency Matching Method