統計後處理技術對於臺灣3-4週降雨預報之校正成效評估

莊美誼[1]　張惠玲[1]　周柿均[1]　馮智勇[2]　林涵芳[2]　洪景山[1]

交通部中央氣象局 氣象科技研究中心[1]
多采科技有限公司[2]

摘　　要

　　由於臺灣展期(10至30天)降雨預報可預報度低，數值模式預報往往無法正確掌握臺灣降雨量值與空間分布，然而臺灣展期降雨預報的應用需求則是日益增長。本研究將結合類比統計後處理技術(Analog Post-processing, AP)與機率擬合平均(Probability-Matched Mean, PM)技術應用於模式預報統計後處理，稱之為APPM。藉由APPM進行臺灣3-4週降雨預報之偏差修正與統計降尺度，進而提供使用者更加精確的定量降雨預報(Quantitative Precipitation Forecasts, QPF)與更加可靠的定量降水機率預報(Probabilistic Quantitative Precipitation Forecasts, PQPF)。

　　過去研究顯示經APPM校正後之1至14天定量降雨預報與定量降水機率預報皆可有效提升預報表現，而3至4週時間尺度在氣象上因預報技術低而被視為可預報度的沙漠(predictability desert)，本研究將探討APPM是否也可於3至4週之時間尺度有相同的校正成效。經長期預報校驗評估顯示，原始模式系集預報呈現散度不足(under-dispersive)，經AP校正之系集預報則可反映真實觀測變異程度。相較於原始模式機率預報，經AP校正之機率預報可靠度更高且區辨能力技術更佳，同時使用經AP校正之機率預報的多數r值(cost/loss ratio)決策者可獲得較高的相對經濟價值。此外，亦顯示APPM校正可修正多數原始定量降雨預報偏差，以及顯著地提升相關性與降低預報誤差。

關鍵字：統計後處理，3-4週降雨預報，預報校驗評估

Statistical Post-Processing of Week 3-4 Precipitation Forecasts over Taiwan

Joyce Juang[1], Hui-Ling Chang[1], Shih-Chun Chou[1], Chih-Yung Feng[2],

Han-Fang Lin[2], Jing-Shan Hong[1]

[1]Central Weather Bureau, Taiwan
[2]Manysplended Infotech Ltd, Taiwan

Abstract

Numerical prediction models cannot correctly predict the extended-range (10-30-day) precipitation amount and pattern over Taiwan due to the low predictability. However, demand for extended-range precipitation forecasts by users in different sectors has grown significantly. In this study, a statistical post-processing technique combining Analog Post-processing (AP) and Probability-Matched mean (PM), called APPM, is used to perform bias correction and downscaling for week 3-4 precipitation forecasts in Taiwan. The purpose is to provide users with more accurate Quantitative Precipitation Forecasts (QPF) and more reliable Probabilistic Quantitative Precipitation Forecasts (PQPF).

Previous study shows that 1-14-day post-processed precipitation forecasts using APPM, including QPF and PQPF, are promising. Here we want to confirm that the APPM method also works for the week 3-4 forecast range, which was thought to be a "predictability desert" with little forecast skill. Forecast evaluation shows that the raw ensemble is under-dispersive, while the calibrated ensemble distribution well represents the observation variability. Compared to the raw forecasts, the AP-based probabilistic forecasts have better reliability and higher skill in discrimination. Users with a much wider spectrum of cost/loss ratio can benefit more from the calibrated forecasts in decision making as compared to the raw forecast. In addition, the calibrated QPF removes most bias and displays obviously higher correlation and reduced error.