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侵台颱風期間近地面最大陣風風速推估
Methodologies for Estimating the Hourly Maximum Wind Gust during Typhoon Period

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摘要

本研究透過台灣定量降雨系集預報實驗(Taiwan Cooperative Precipitation Ensemble forecast Experiment, TAPEX)，每日 4 次，每次產出 20 組近地面 10 米風速預報資料。利用 20 組系集成員等權重產生系集平均(MEAN)，同時將風速預報資料經由短時校驗(第 1 至 6 小時)，選取預報能力最佳之前 25% 成員產生系集最佳化平均(MEAN_TOP5)。分析包含 2015 年蘇迪勒與杜鵑颱風共 10 次預報，統計 26 個中央氣象局局屬測站，結果顯示最佳化平均預報能力較佳。

陣風推估應用首先分析 26 個測站於 12 場警報颱風事件中，最大陣風與平均風速之相關性 獲得各測站之線性迴歸式。由此迴歸式，將系集平均(MEAN)與最佳化平均(MEAN_TOP5)風速預報資料進行最大陣風推估。此外，透過最大陣風觀測值與風速預報資料(第 1 至 6 小時)，經由微基因演算法推算兩者之比值(陣風因子)，於海上颱風警報發佈起始，逐次修正陣風因子，並進行最大陣風風速推估。結果顯示，經由微基因演算法推估之最大陣風將能改進特定測站之最大陣風風速高估之情況。本文透過持續提升準確度的風速預報，近而改進最大陣風掌握能力，期望對於防災、台灣本島及離岸風機的維運策略與防災機制能有助益。

關鍵詞：系集、颱風風速、陣風推估、微基因演算法。

Abstract

This study applied the 10-m wind speed forecast data from Taiwan Cooperative Precipitation Ensemble Forecast Experiment (TAPEX) to estimate hourly maximum wind gust during typhoon period. We have the Ensemble Mean 10-m wind forecast from the average of 20 members in TAPEX and also have the top 5 members as Top5 Mean via real time wind speed verification. Study cases including typhoon SOUDELOR (2015) and DUJUAN (2015) are 10 forecasts (5 for each) and indicate that Top5 Mean performed better than ensemble mean in all 22 stations of Central Weather Bureau.

To estimate hourly maximum wind gust, we firstly have the regression function for each 26 stations applying the observational wind gust and wind speed data including historical 12 typhoons. Following the regression function of each station, we derived the wind gust using wind speed forecast data from Ensemble Mean and Top5 Mean. In the other hand, a Micro Genetic Algorithm was also applied to do wind gust estimation. For operating purpose, we calculated the first time gust factor when typhoon warning issued by Central Weather Bureau and gust factor will be modified totally five times. To sum up, results indicate that Micro Genetic Algorithm can improve maximum wind gust estimation for stations been over forecasted and we anticipated that more accurate wind gust forecast can do benefits to the security aspect of Wind Power operating system.

Keywords: Ensemble, Wind Forecast, Wind Gust, Micro Genetic Algorithm.