WE_02
利用數值天氣模式重建風場資料庫

王尹懋[1]、戴志輝[2*]、林博雄[12]、苗君易[3]、李中宏[4]
[1]國立臺灣大學大氣科學系
[2]國立臺灣大學大氣資源與災害研究中心
[3]國立成功大學航空太空工程學系
[4]永傳能源股份有限公司
Wang, Mark Yin-Mao[1], Jyh-Huei Tai[2*], Po-Hsiung Lin[12], Jiun-Jih Miau[3], Chuck Li[4]
[1]Department of Harbor and River Engineering, National Taiwan Ocean University
[1] Department of Atmospheric Sciences, National Taiwan University
[2] Center for Atmospheric Resource and Disaster Studies, National Taiwan University
[3] Department of Aeronautics and Astronautics, National Cheng-Kung University
[4] Taiwan Generations Corporation
[*]Contact: taijh@ntu.edu.tw

摘要

本分析使用 WRF 模式（Weather Research and Forecast model），以美國國家環境與氣候預報中心（NECP FNL）0.25°×0.25°經緯度的重分析（reanalysis）資料為模擬的初始與邊界條件，在 25、5、1 km 為空間解析度的網巢架構下，針對 2015 年秋、冬兩季進行天氣模擬（個案一：10 月 6 日 16:10 UTC～11 月 6 日 16:00 UTC，個案二：11 月 30 日 16:00 UTC～12 月 31 日 15:50 UTC），以重建（reconstruct）包含台灣中部陸域和海域 120x120 km2 範圍內的高解析度天氣資料，並與位於該範圍內的福海離岸風塔觀測資料進行比對。

在最接近永傳能源公司福海風塔的格點（120.2720°E, 24.04418°N），我們將電腦模擬的近海面風場結果來重建該地區的風速頻率分布（Possibility Distribution Function）特徵；此外，本研究將 17.9 m、44.4 m 及 80 m 等三層風速模擬數值，與永傳福海測風塔 20 m、50 m 及 86 m 高度上的風速觀測值進行比較；在秋季個案一個月期間，兩者相關係數為 0.8942～0.9042，在冬季個案一個月期間則為 0.8638～0.8750。我們發現 50 m 及 86 m 這二層高度，模式模擬的風速略低於觀測約 0.5 ms-1。根據前述結果，本研究所採用的數值模式模擬策略，應可應用於離岸風機選址及風能潛勢評估。此外，透過風場的東西（U）與南北（V）分量比對，模擬之風場可以協助判斷測風塔觀測數值的可信度。

關鍵詞：福海離岸風塔、模擬重建風速

Abstract

This study utilize 3-nested domains (25, 5 and 1 km horizontal resolution) of the WRF model (Weather Research and Forecast model) to re-construct high temporal- and spatial-resolution data, and validate with the observation of Fu-Hai off-shore wind tower set in the region of 120 by 120 km2 covering both land and sea of central Taiwan. The NCEP (National Centers for Environmental Prediction) FNL 0.25° longitude and latitude reanalysis gridded data are chosen for the WRF initial and lateral data. Simulated periods are in autumn (16:10 UTC 6 Oct. to 16:00 UTC 6 Nov.) and winter (16:00 UTC 30 Nov. to 15:50 UTC 31 Dec.) of 2015.

The Fu-Hai wind tower maintained by Taiwan Generations Corporation is located at 120.2720°E and 24.04418°N. The simulated WRF wind data at 17.9 m, 44.4 m and 80 m above-ground-level (AGL) are selected and compare to the wind tower data at 20 m, 50 m and 86 m AGL. Results show that the correlation coefficients of those 2 data in autumn and winter seasons are 0.8942～0.9042 and 0.8638～0.8750, respectively. The WRF wind fields are slightly weaker than observation at 50m and 86m. Therefore, the strategy of this study is suitable and it can be applied to evaluate the potential of wind energy and off-shore areas for setting wind farm. Furthermore, the simulated wind fields provide

another data to clarify the confidence of wind tower observation.

Keywords: Fu-Hai off-shore wind tower, simulation of re-construct wind field