全球天氣預報模式fv3GFS風能模擬之應用與發展
Utilization & Development of fv3GFS for Wind Energy Simulation

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摘　　要

　　本研究主要工作是發展全球天氣預報模式fv3GFS的風能模擬能力，透過fv3GFS導入Fitch風場參數化模組，搭配變解析度伸縮網格或區域巢狀網格提高水平網格解析度，達成以全球天氣預報模式模擬陸域/離岸風機發電狀況之研究目標。本研究比較2021年輕度颱風彩雲與中度颱風煙花影響台灣期間模擬區域觀測資料，全球天氣預報模式fv3GFS可以得到合理的風場模擬結果，另外還比較目前實際運轉中彰工陸域風電廠與海洋竹南離岸風電廠的發電量，除了得到個別電廠合理模擬逐時發電量，也得到風機所在網格的風機輪轂高度十分鐘平均風速與3秒鐘瞬間陣風，對於了解極端天氣影響下風機設計與規劃提供有用資訊。

關鍵字：風能預報、風場參數化、全球天氣預報模式

Abstract

　　Wind farm parameterization developed by Fitch et al. (2012, 2013) had been implemented into the global forecast system fv3GFS. The fv3GFS with enhanced regional refinement, such as stretched grid or nested grid, enables this global system for simulating mesoscale or microscale phenomena. This study further utilized the fv3GFS with Fitch wind farm parameterization for wind energy assessment in the vicinity of Taiwan. Tropical Storm Choi-wan and Typhoon In-fa in 2021 were simulated to understand wind conditions under extreme weather events. The fv3GFS demonstrated reasonable surface wind simulations. Simulated power generations compared with hourly observations of Chung-gong Wind Power Plant and Formosa I Offshore Wind Farm, respectively, also showed reasonable results. Other than the regular outputs, the dedicated outputs of 10-min averaged wind speed and 3-sec maximum gust wind at hub height provide important information for turbine assessments and arrangements.

Key words: wind energy forecast, wind t farm parameterization, fv3GFS