CWA-OCM-FH福島擴增範圍海流模式校驗分析

Validation and Analysis of the Fukushima Expanded Range Ocean Current Model in CWA-OCM-FH.

王啓竑[1] (Chihung Wang) 鄭皓宇[1] (Haoyu Cheng) 于嘉順[1] (Jason C.S. Yu)
曾慧婷[2] (Hui-Ting Zeng) 鄧仁星[2] (Jen-Hsin Teng)

[1]西灣海環科技股份有限公司 [2]中央氣象署海象氣候組
[1]Baytech Environment and Engineering Inc.
[2] Marine Meteorology and Climate Division, Central Weather Administration

摘　要

因應日本核廢水排放問題，建置「福島氚廢水海洋傳輸擴散分析及預報作業系統」，預期達成(西)北太平洋放射性物質擴散濃度趨勢分布及時間/空間預測結果，由於目前中央氣象署三維作業化海流模式(CWA-OCM)之東部邊界位於約東經147度處，但考量在氚廢水排放後，日本沿岸黑潮及黑潮延伸流對於氚廢水傳輸影響較大，模式邊界過於接近福島海域，因此，本計畫研議配福島氚廢水傳輸擴散模式需求，由氣象署海象氣候組另外建立適合福島氚水排放之海流作業化模式(CWA-OCM-FH)，將模式範圍之東部邊界擴展至東經180度，將黑潮延伸流納入模式計算，因此在水深較深的區域，網格設計較疏，在近岸或水深變化複雜的區域，網格面積則設計較密，將近岸地形解析度設為約1公里，離岸越遠將逐漸放疏網格。因背景場採用HYCOM全球海洋模式資料，故外海解析度將放疏至與HYCOM模式相近之解析度約為1/12度，除了增加計算速率，同時也能清楚解析近岸區流場時空變化。本計畫在校驗系統中的量化指標預計使用皮爾遜積差相關係數(coefficient of correlation, R值)、決定係數(coefficient of determination, R^2)以及均方根誤差(Root Mean Square Error, RMSE)進行一年以上的模式校驗及分析。

關鍵字：中央氣象署、海流預報、福島、氚水

Abstract

In response to the issue of tritiated water discharge in Japan, a project has been initiated to establish the "Fukushima Tritium Treated Water Transport and Diffusion Analysis and Forecasting System." This system aims to predict the trends and spatial/temporal distribution of radioactive substance diffusion in the North Pacific Ocean. Due to the eastern boundary of the existing Central Weather Bureau's three-dimensional operational ocean current model (CWA-OCM) being located at approximately 147 degrees east longitude, and considering the significant influence of the Kuroshio Current and its extension on the transport of tritiated water post-discharge, the model's boundary is deemed too close to the Fukushima area. Consequently, the project proposes the development of a specialized ocean current operational model (CWA-OCM-FH) for the Fukushima tritium water discharge, extending the model's eastern boundary to 180 degrees east longitude. This adjustment includes the Kuroshio extension in the model calculations. The grid design is sparser in deeper water areas and denser near the coast or in areas with complex depth changes, with a coastal terrain resolution of approximately 1 kilometer, gradually coarsening offshore. The background field utilizes HYCOM global ocean model data, thus the offshore resolution will be adjusted to approximately 1/12 degree similar to HYCOM, enhancing computational speed while clearly resolving the temporal and spatial changes in the coastal flow field. The project plans to use quantitative indicators such as the Pearson

correlation coefficient, the coefficient of determination (R2), and the Root Mean Square Error (RMSE) for over a year of model validation and analysis.

Key words : Central Weather Administration, ocean current forecasting, Fukushima, tritiated water