

放射性物質海洋擴散模式應用

Application of the Oceanic Dispersion Model for Radioactive Substances by the Central Weather Administration

朱熾儒¹ (Chu Y.-J.) 曾慧婷¹ (Zeng H.-T.) 鄧仁星¹ (Teng J.-H.)

¹中央氣象署海象氣候組

¹Marine Meteorology and Climate Division, Central Weather Administration

摘要

臺灣周邊緊鄰中國大陸多座沿海核電廠，且每年不定期排放含氚廢水，為了因應日本福島事件後對放射性物質海洋擴散的預警需求，中央氣象署開發了「放射性物質海洋擴散預報系統」。本研究應用該系統，結合2021 – 2025年歷史海流資料，並基於與臺灣本島與離島的直線距離、歷年排放量規模及海流特性等原則，挑選福建福清、浙江秦山與廣東大亞灣三座代表性核電廠，模擬其在「2020年中國核能年鑑」中呈現之年排放量限值下的含氚廢水連續擴散情形。模擬結果顯示，由於臺灣海峽西側海流主要受大陸沿岸流影響，金門與馬祖最易受到含氚廢水擴散影響；臺灣本島周邊海域則在季節交替時，當海流流速減慢，會造成含氚廢水滯留或向本島擴散。研究結果顯示，氣象署可依據不同地理位置與季節條件之擴散特徵，提出設站建議或其他相應的對策。

關鍵字：放射性物質海洋擴散預報系統、中國核電廠、含氚廢水

Abstract

Several coastal nuclear power plants are located along the southeastern coast of China near Taiwan, and release tritiated water intermittently each year. In response to the need for forecast and early warning of radioactive material dispersion in the ocean following the Fukushima incident in Japan, the Central Weather Administration (CWA) developed the "Oceanic Dispersion Forecast System for Radioactive Substances." This study applies the system in conjunction with historical ocean current data from 2021 to 2025. Based on three criteria—including the direct distance to Taiwan (including offshore islands), annual discharge volume, and regional ocean current characteristics—three representative nuclear power plants were selected: Fuqing in Fujian, Qinshan in Zhejiang, and Daya bay in Guangdong. Simulations were performed under continuous tritium discharge scenarios, using the annual discharge limits published in the 2020 China Nuclear Energy Industry Annual Report. Results indicate that ocean currents on the western side of the Taiwan Strait are primarily influenced by the China Coastal Current, making the offshore islands of Kinmen and Matsu more susceptible to tritium dispersion. Around Taiwan's main island, however, the impacts become more pronounced during seasonal transitions, when current velocities decrease, leading to tritiated water accumulation or northeastward transport toward the island. The findings suggest that the CWA can provide site selection recommendations and responsive strategies based on the distinct dispersion characteristics under varying geographic locations and seasonal current conditions.

Key words : Oceanic Dispersion Forecast System for Radioactive Substances 、 China nuclear power plant(s) 、 tritiated water