

# Performances of Regional Model for Prediction Across Scales (MPAS) in Simulations of Typhoon Gaemi (2024) impinging Taiwan

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## Abstract

This study utilizes the regional version of Model for Prediction Across Scales (MPAS) to investigate the track deflection of typhoon Gaemi in 2024. In previous experiments, the results reveal that when the domain is enlarged beyond a certain threshold, the simulation results such as typhoon track may resemble those produced using a global domain configuration. This finding suggests that an appropriately chosen limited-area domain can effectively reproduce key features of a tropical cyclone while reducing computational costs.

Based on the preliminary domain tests, this study applied a regional domain at 20-2 km resolution to simulate Typhoon Gaemi (2024) associated with a looping track offshore near northern Taiwan. Due to the topographic influence of the Central Mountain Range (CMR), Gaemi took a southward deflection caused by the effect of flow channeling near east of the central CMR, then followed with a rapid north turn to form a looping track. Compared with the global MPAS simulations at 60-15-1 resolution, this study aims to explore how well regional MPAS captures the track and intensity of Gaemi. Different physic schemes were tested for an optimal simulation of Gaemi's track looping and potential vorticity budget analyses then were conducted for illustrating the typhoon structure and motion at the looping stage in this study.

Key words : Regional Model for Prediction Across Scales (Regional MPAS), Potential Vorticity (PV), Dynamic Vortex Initialization (DVI)