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## Verifications of Week-1 to Week-4 Tropical Cyclone Forecasts in the Western North Pacific from the ECMWF 46-Day Ensemble

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This study uses the ECMWF 46-day ensemble to evaluate the subseasonal forecasts of tropical cyclones (TCs) in the western North Pacific, including TC formations, tracks, intensity, and precipitation forecasts. TC formations and the subsequent tracks are objectively detected in both real-time forecasts and also the 20-year ECMWF reforecasts. Additionally, a spatial-temporal track clustering technique is utilized to group similar vortex tracks in the 101-member real-time forecasts for operational application. The forecast verification focuses on evaluating the influence of large-scale environmental factors on TC forecast skills during weeks 1-4, such as the Western North Pacific Summer Monsoon (WNPSM), Madden Julian Oscillation (MJO), and Boreal Summer Intraseasonal Oscillation (BSISO). The Precision-Recall (PR) curve is used to represent the imbalanced TC data instead of the Receiver Operating Characteristic (ROC) curve. Better TC forecast skills are observed if model initialized on MJO Phases 6 and 7 for the week-1 forecasts, and on MJO Phases 4 and 5 for the weeks 2 and 3 forecasts. Also, TC forecast skills are better if the cumulative percentage of the WNPSM index (Wang et al. 2001) is larger than 60%. This study also investigates the TC precipitation forecast skill around Taiwan area.

The evaluation results obtained from this study has been integrated into the TC Tracker 2.0 system developed by Central Weather Administration (CWA). The system can generate a "Subseasonal TC Threat Potential Forecast" product to assist in disaster mitigation and water resources management for the Water Resources Agency. More details about the subseasonal TC forecast verifications and applications will be presented in the meeting