# Evaluation of Synoptic Systems in East Asia using S2S forecast

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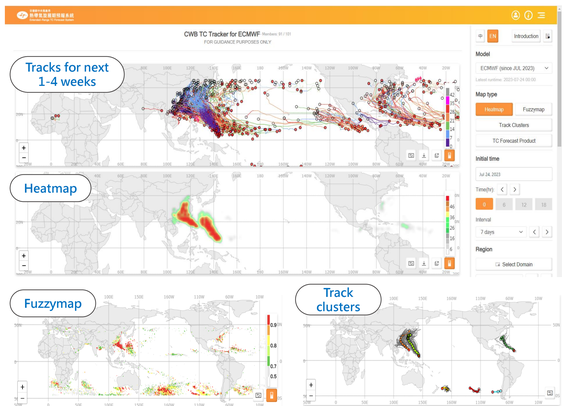
**Abstract** This study focuses on assessing the forecasting capabilities of the GEFS (Global Ensemble Forecast System) and ECMWF ensemble model for typhoons, East Asian monsoon, and MJO over week-1 to week-4. Preliminary results indicate that the model exhibits better predictability for tropical cyclone forecasts within 2 weeks, and tropical cyclone forecast skills are better if the cumulative percentage of the WNPSM index (Wang et al. 2001) is larger than 60%. 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 "Sub-seasonal TC Threat Potential Forecast" product to assist Water Resources Agency (WRA) in disaster mitigation and water resources management. It also demonstrates forecast capabilities for the East Asian monsoon ranging from 2 to 3 weeks in advance. Furthermore, evaluations indicate that intra-seasonal oscillation forecasts show enhanced performance during weeks 2 to 3 of El Niño events compared to normal years and La Niña years. This analysis emphasizes the importance of S2S forecast in enhancing our understanding and predictive capabilities of regional climate phenomenon.

## The interface of CWA TC Tracker2.0 website



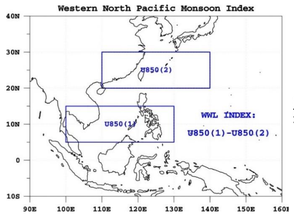

https://tctracker.cwa.gov.tw/

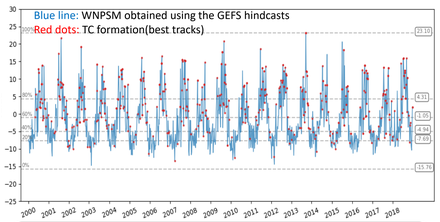
**Models**
- ECMWF
- NCEP GEFSv12
- NCEP CFSv2
- CWA1T1

**Information**
- Heatmap
- Fuzzymap
- Track Clusters

**Flexible Web**
- Bottons to switch
- Adjust time interval
- Zoom-in or out maps
- Download maps
- Custom conditions

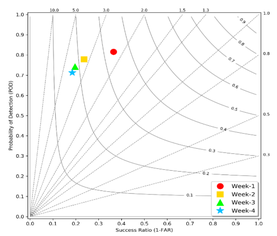
## Evaluations of subseasonal TC forecast

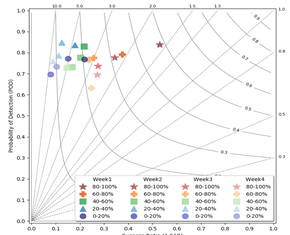



All hindcast

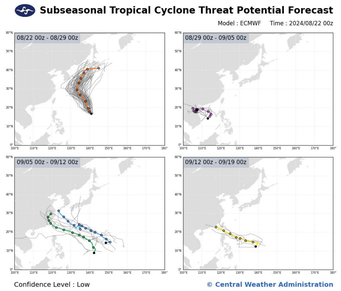
All hindcast with different intensity of summer monsoon index



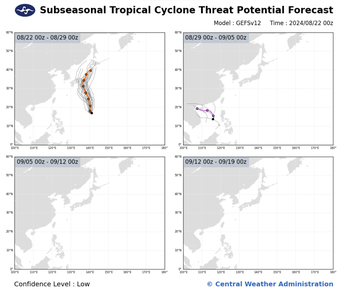




## The subseasonal tropical cyclone threat potential forecast product

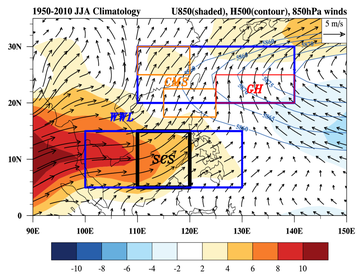
ECWMF



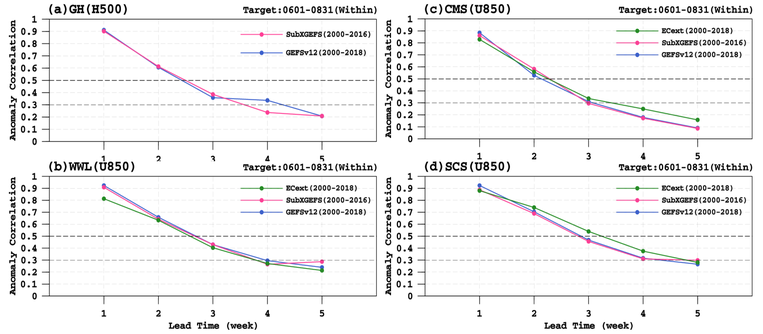

NCEP GEFSv12



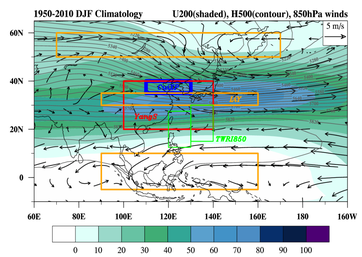

## Evaluations of summer monsoon indices



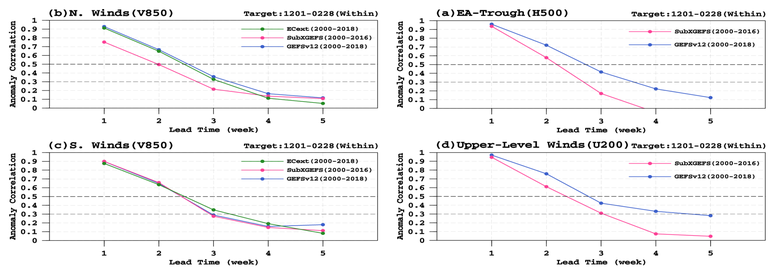

| Indices | Variable | Definition |
|---|---|---|
| GH, Subtropical High<br>Gong and Ho (1999) | 500hPa Geopotential Height (H500) | (20°-25°N, 125°-140°E) |
| WWL, WNP monsoon<br>Wang et al. (2001) | 850hPa Zonal Wind (U850) | (5°-15°N, 100°-130°E) – (20°-30°N, 110°-140°E) |
| CMS, Local Circulation near Taiwan<br>Chen (2011) | 850hPa Zonal Wind (U850) | (17.5°-22.5°N, 115°-125°E) – (25°-30°N, 110°-120°E) |
| SCS, SCS monsoon<br>Wang et al. (2004) | 850hPa Zonal Wind (U850) | (5°-15°N, 110°-120°E) |




## Evaluations of winter monsoon indices

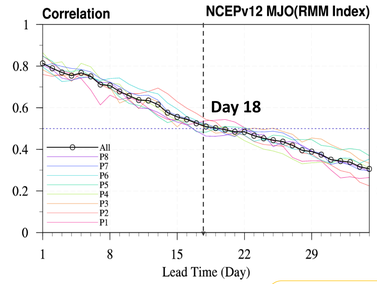



| Indices | Variable | Definition |
|---|---|---|
| CuiXP, EA-Trough<br>Cui and Sun (1999) | 500hPa Geopotential Height (H500) | (35°-40°N, 110°-130°E) |
| YangS, N. Winds<br>Yang et al. (2002) | 850hPa Meridional Wind (V850) | (20°-40°N, 100°-140°E) |
| LiY, Upper-Level Winds<br>Li and Yang (2010) | 200hPa Zonal Wind (U200) | { [(30°-35°N, 90°-160°E) – (50°-60°N, 70°-170°E)] + [(30°-35°N, 90°-160°E) – (5°S-10°N, 90°-160°E)] }*0.5 |
| TWRI850, S. Winds | 850hPa Meridional Wind (V850) | (12.5°-27.5°N, 120°-130°E) + (15°-30°N, 130°-140°E) |

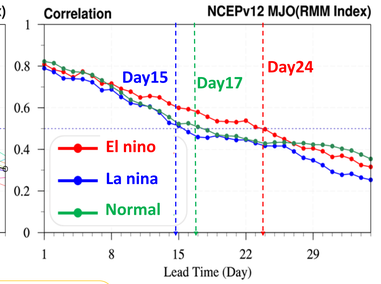



## Evaluations of Madden-Julian Oscillation index

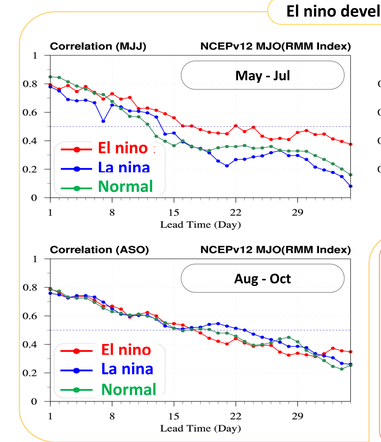
All hindcast



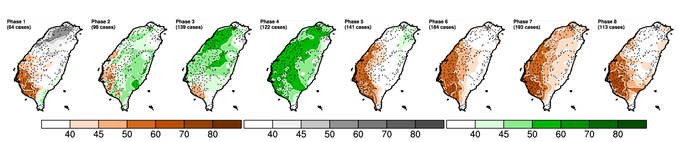

Elnino Lanina and Normal years



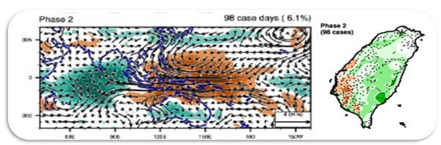

**El nino developing year**




## Evaluations of MJO impact on Taiwan




Observation




GEFSv12 Hindcast