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Preliminary Evaluations of the Extended-Range Tropical Cyclone (TC) Forecasts in the Western North Pacific and Taiwan Area by using the ECMWF S2S Forecasts

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Abstract

The predictability of the 1-4 week tropical cyclone (TC) forecasts in the western North Pacific is evaluated in this study. The CWB TC Tracker (Tsai et al. 2011; Wea. Forecasting) is utilized to objectively detect TCs in the 28-day ECMWF Subseasonal to Seasonal(S2S)real-time forecasts during 2015-2017.

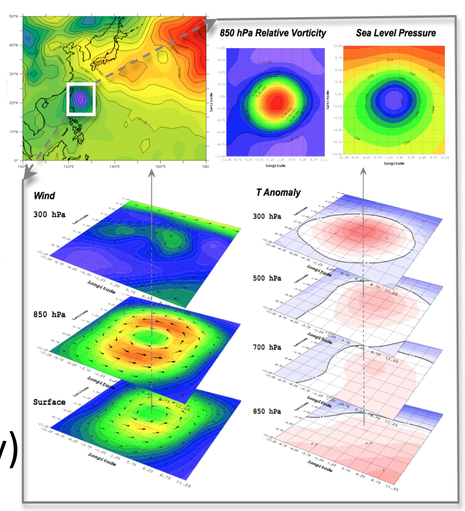
Preliminary verifications for the TCs in the western North Pacific (100°E-180°E, 0-60°N) show that the forecast skill in the subregion(120°E -150°E, 5°N-40°N) is higher than those in the South China Sea (105°E-120°E, 5°N-25°N) and Central Pacific (150°E-180°E, 5°N-40°N). In the western North Pacific, the Threat Scores in Weeks 1-4 are about 0.4, 0.3, 0.2, and 0.2, respectively. Moreover, the skill of the S2S forecasts in predicting the TCs affecting the Taiwan area is explored. The Threat Scores from Week-1 to Week-4 forecasts are all higher than 0.4. The evaluation results show that the ECMWF S2S forecasts are able to provide the TC strike probability forecast information for the Taiwan area.

ECMWF S2S forecast data

- 1 May 2015 to 31 Oct 2017
- Ensemble size: 51 members
- Forecast length: 46 days
- Frequency: every Monday and Thursday
- Model Resolution: 1.5 x 1.5 degree

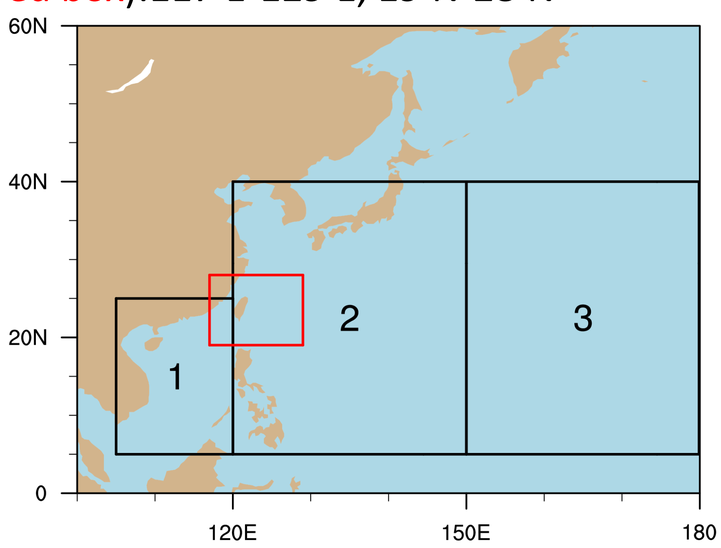
TC Tracking Method (Tsai et al. 2011; *Wea. Forecasting*)

- **TC detection criteria:**
  1. 850 hPa relativity vorticity ≥ 5×10^{-5} s^{-1}
  2. Maximum surface wind speed ≥ 10.0 m/s
  3. Minimum MSLP in a 3×3 grid-box domain
  4. $T_{anomaly,\ 300hPa} > 0$
  5. $T_{anomaly,\ 300hPa} > T_{anomaly,\ 850hPa}$
  6. EKE_{850hPa}-EKE_{300hPa}> 0 (Eddy Kinetic Energy)
- **Lifecycle:** A TC must last at least 24 hours



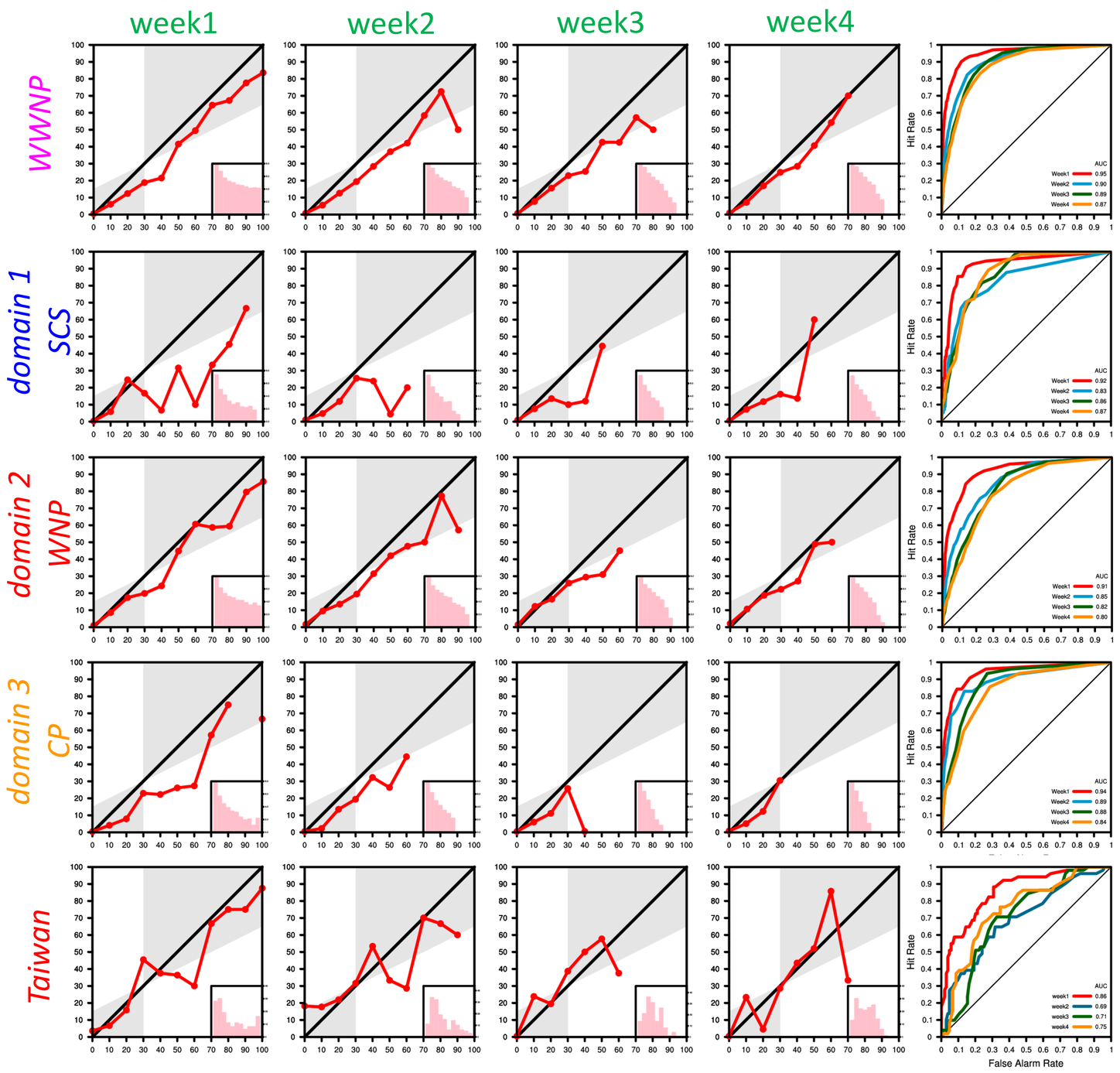
Verification Domains

Whole Western North Pacific(WWNP): 100°E-180°E, 0-60°N
South China Sea(SCS; domain 1): 105°E-120°E, 5°N-25°N
Western North Pacific(WNP; domain 2): 120°E-150°E, 5°N-40°N
Central Pacific(CP; domain 3): 150°E-180°E, 5°N-40°N
Taiwan(red box):117°E-129°E, 19°N-28°N



2015-2017 ECMWF S2S TC Activity Forecast Verification

Reliability Diagram & Relative Operating Characteristic(ROC) Curve



Performance Diagram