

Preliminary Analysis of the Combined Effects Forecast of Typhoon Nesat in 2022.

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Motivation

By studying the accompanied effect of autumn typhoons, we have found that they pose a significant threat to northern Taiwan. We have analyzed multiple numerical forecasts of Typhoon Nesat in 2022, and our goal is to identify the rainfall hotspots that best match the actual conditions during the accompanying effect. By doing so, we hope to develop improved measures to mitigate the impact of typhoons and ensure the safety of people living in northern Taiwan.

Paper review

Typhoons associated with the northeast monsoon impacting Taiwan Definition:

Occurring during October and November, with the Typhoon center between 16 to 26N and 118 to 124E (based on JTWC's best track).

Frontal system near Taiwan.

24hr rainfall at the Zhuzihu (竹子湖) or Yilan (宜蘭) stations reach heavy rainfall (130 mm).

Strong northeast winds were observed at the Pengjia Islet (彭 佳嶼)weather station.



Case analysis

Data and Method

Definition of Accompanied effect:

The Typhoon center is positioned between 16-26°N, and 114-124°E.

The cumulative rainfall at Zhuzihu (竹子湖)or Yilan (宜蘭) weather stations meets the definition of heavy rainfall.

There is a significant convergence between the northeasterly monsoon and the outer-region circulation at 925hPa.

The boundary between cold and warm air appears to be positioned over the airspace of Taiwan.



This study uses the CReSS model (Tsuboki and Sakakibara in 2007.) The model is initialized and provided with boundary conditions based on the Global Forecast System 0.5-degree analysis and forecast fields.

The data has a horizontal resolution of 2.5 km and a vertical resolution of 500 m. The horizontal grid measures 800x600 and there are 40 vertical layers.

At 12:00 UTC on October 13th, the forecasting process will begin. There will be a total of seven forecast runs, with each run conducted every 12 hours. The final forecast run will conclude at 12:00 UTC on October 16th.

ECMWF Reanalysis v5 (ERA5)(0.25° x 0.25° (atmosphere))







Conclusion

All seven forecasts have detected changes in theta-e and convergence fields, with rainfall hotspots covering both northern and northeastern areas. The accuracy of the forecasts depends on the timing of the accompanied effect and the typhoon's location. Reference

