

大氣模式對臺灣地區致災性降雨個案之預報能力

Prediction Skills of Atmospheric Models for Catastrophic Rainfall Cases in Taiwan

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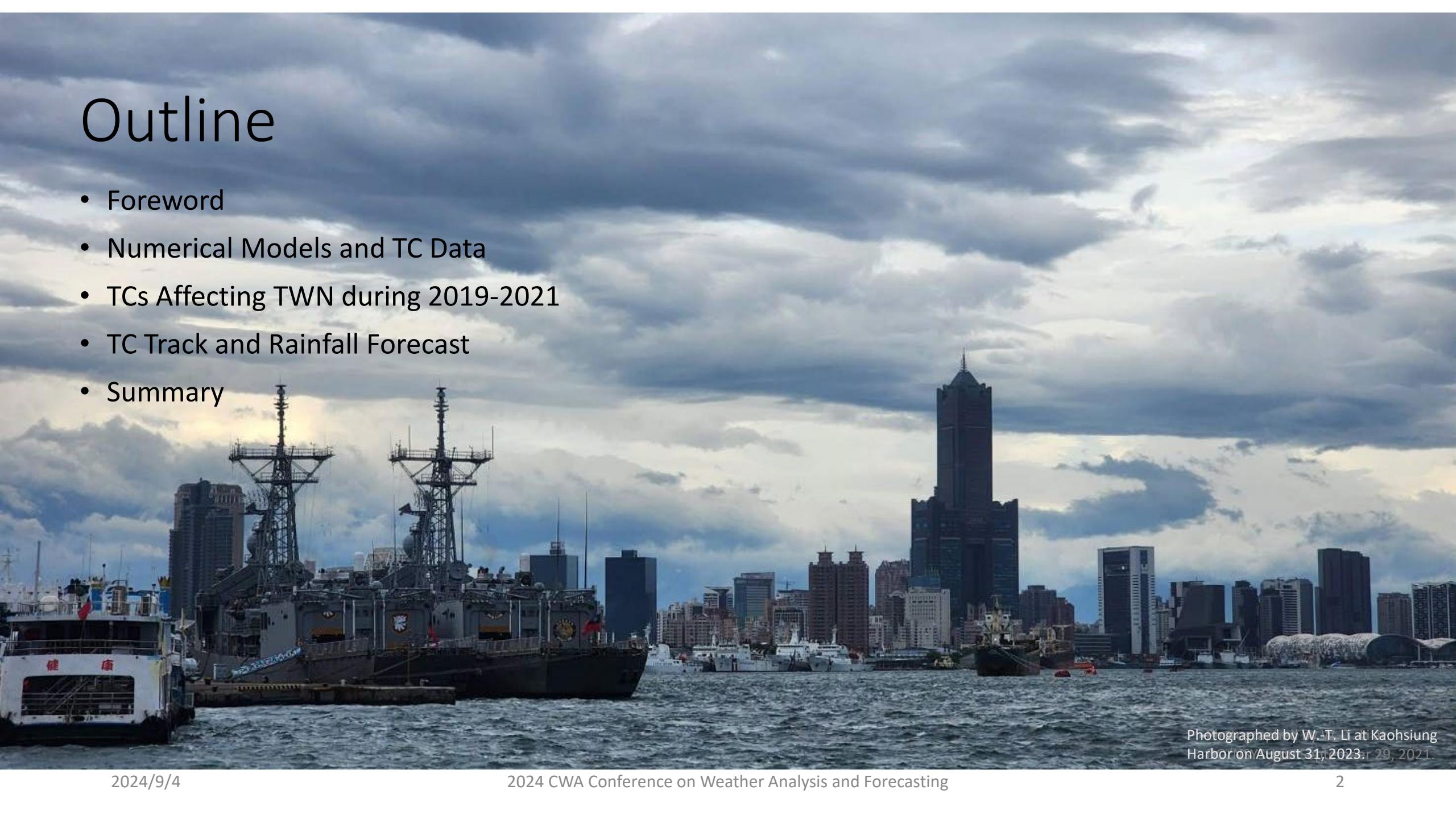
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September 4, 2024



Outline

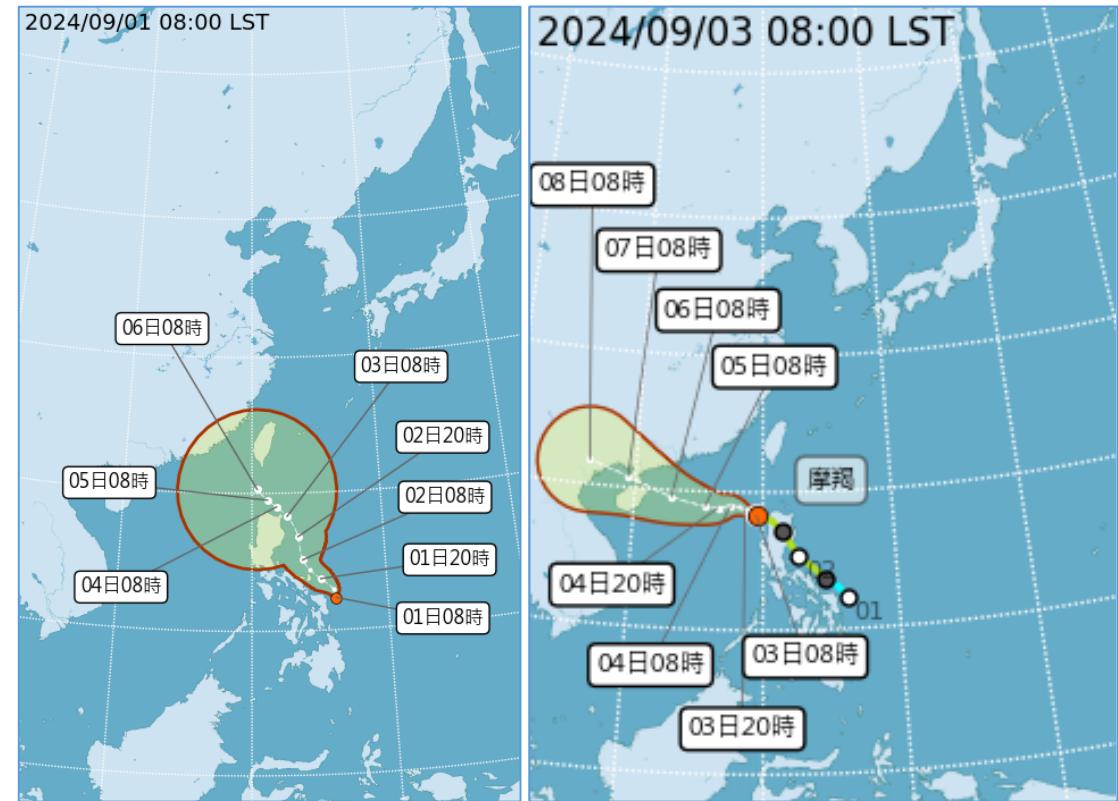
- Foreword
- Numerical Models and TC Data
- TCs Affecting TWN during 2019-2021
- TC Track and Rainfall Forecast
- Summary



Photographed by W.-T. Li at Kaohsiung Harbor on August 31, 2023 or September 29, 2021.

Foreword

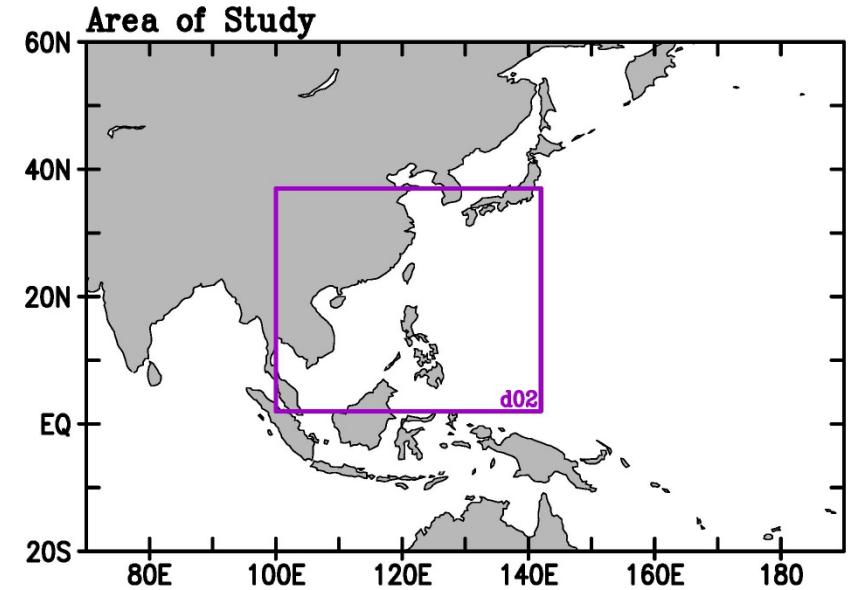
- Tropical cyclone (TC) track forecast
 - Multi large-scale mechanisms affect TC tracks, incl. PSH, ISO, ENSO. (Tu and Chen 2019; Li et al. 2022; Lai et al. 2022, Lai et al. 2023)
 - TC track forecast is more reliable between 24-48 hr. (Chen and Jian 2010)
- Purpose of this study
 - To improve TC rainfall forecast
=> Diagnose TC rainfall with track forecast by using different models



The track forecasts of TC YAGI (202411魔羯) are downloaded from the CWA website.

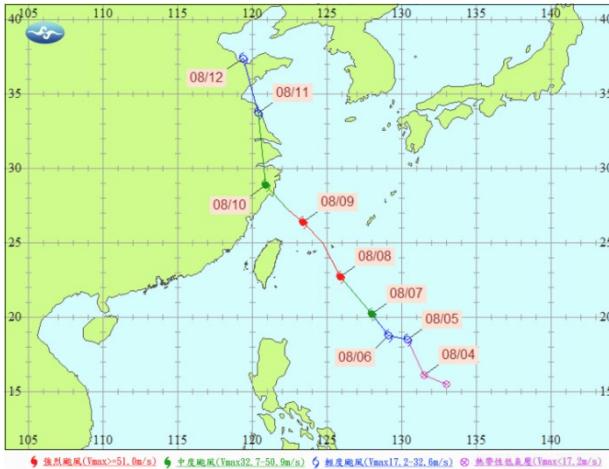
Numerical Models and TC Data

- Numerical models
 - **WRF** (Weather and Forecast)
 - Driven by GFS/NCEP
 - Domain (d02) covers East Asia and SCS
 - Spatial and temporal resolution: 9 km and hourly
 - **MSM** (Mesoscale Spectral Model)
 - Driven by GFS/NCEP
 - Domain (d02) covers East Asia and SCS
 - Spatial and temporal resolution: 9 km and hourly
 - TC data
 - JTWC best track during 2019-2021
 - Classification of TCs affecting Taiwan by CWA
- => Compare TC tracks and rainfall from model outputs (00, 24, 48, 72, and 96-hr)

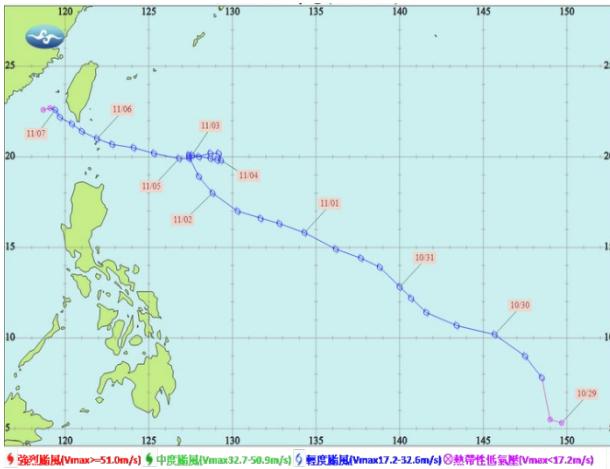


TCs Affecting Taiwan during 2019-2021

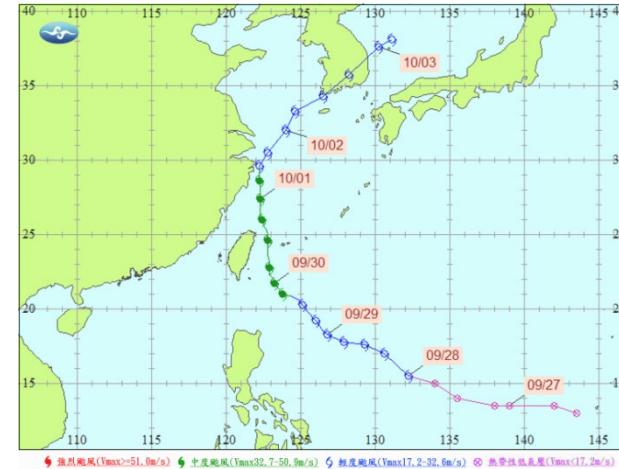
Lekima (2019)



Atsani (2020)



Mitag (2019)



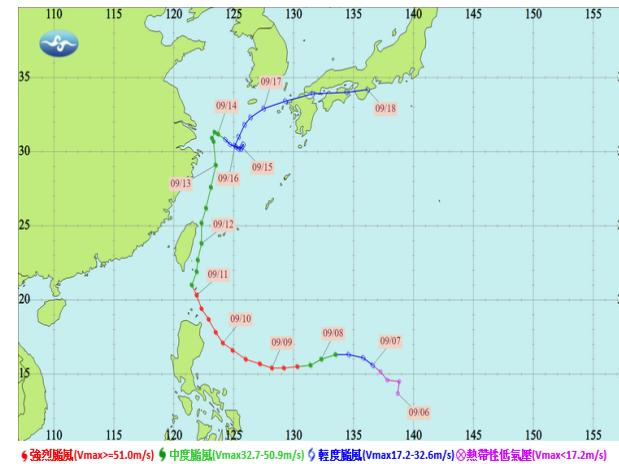
Bailu (2019)



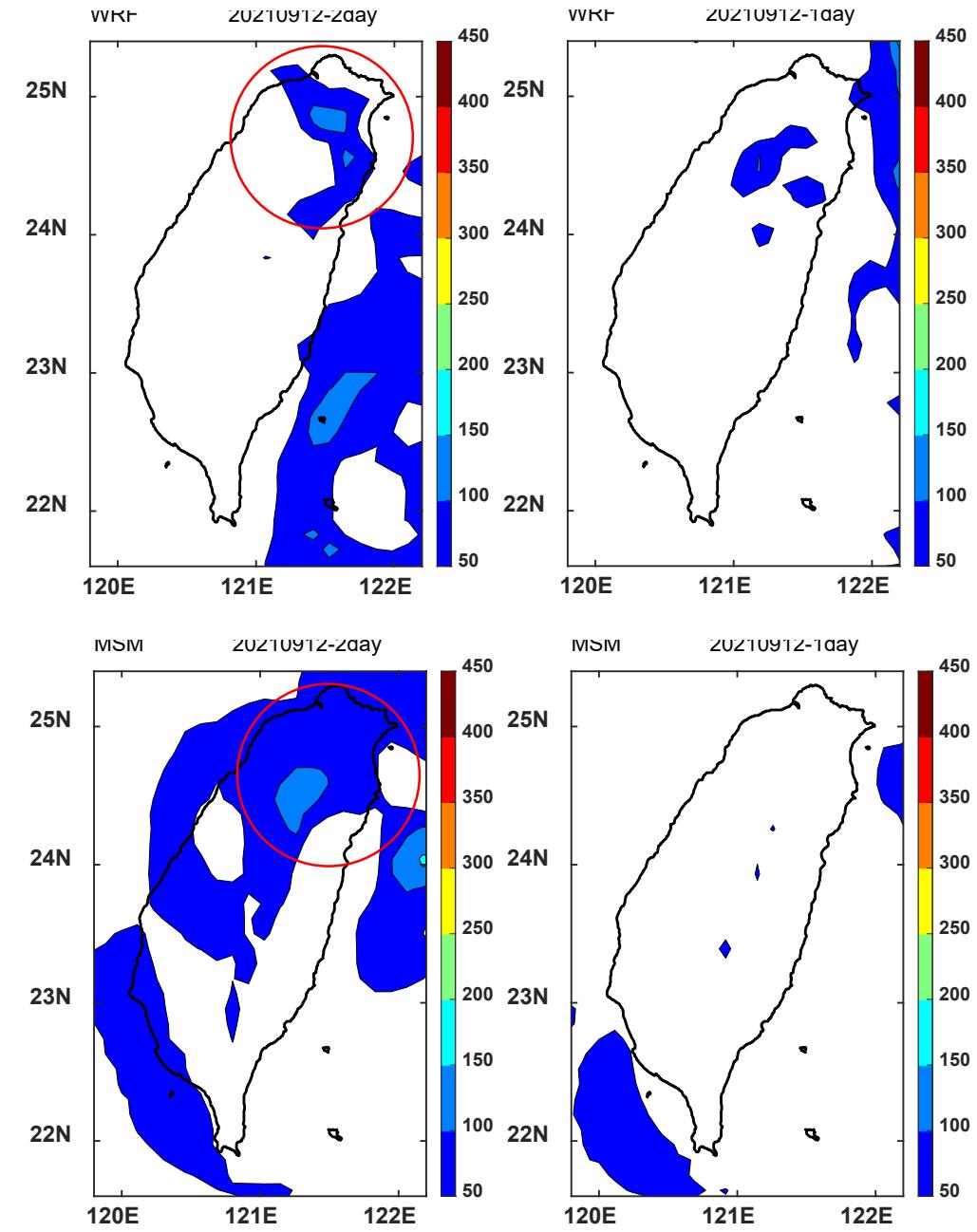
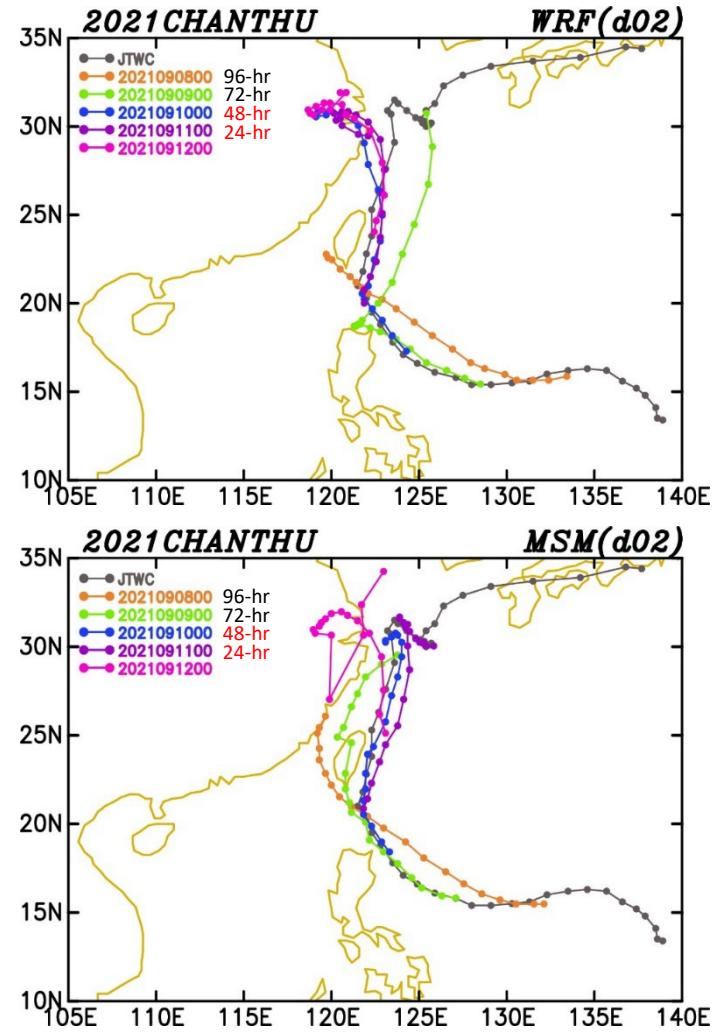
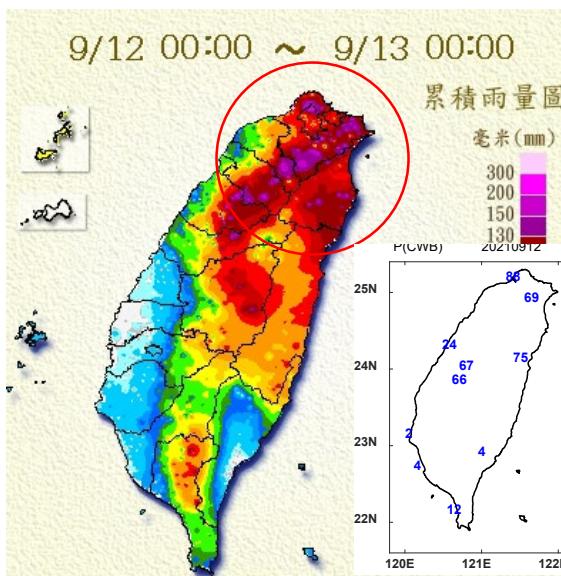
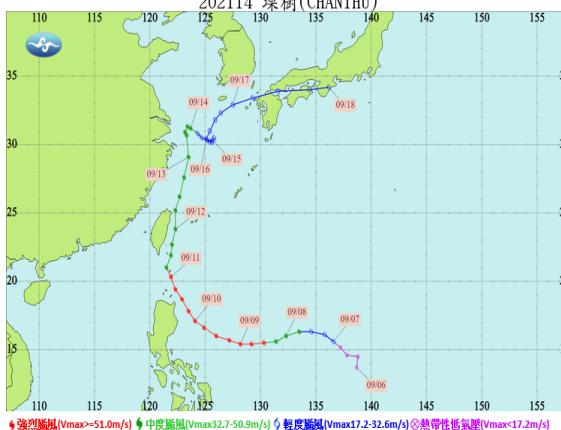
- Analyze TC rainfall forecast

- By examining largest precipitation day

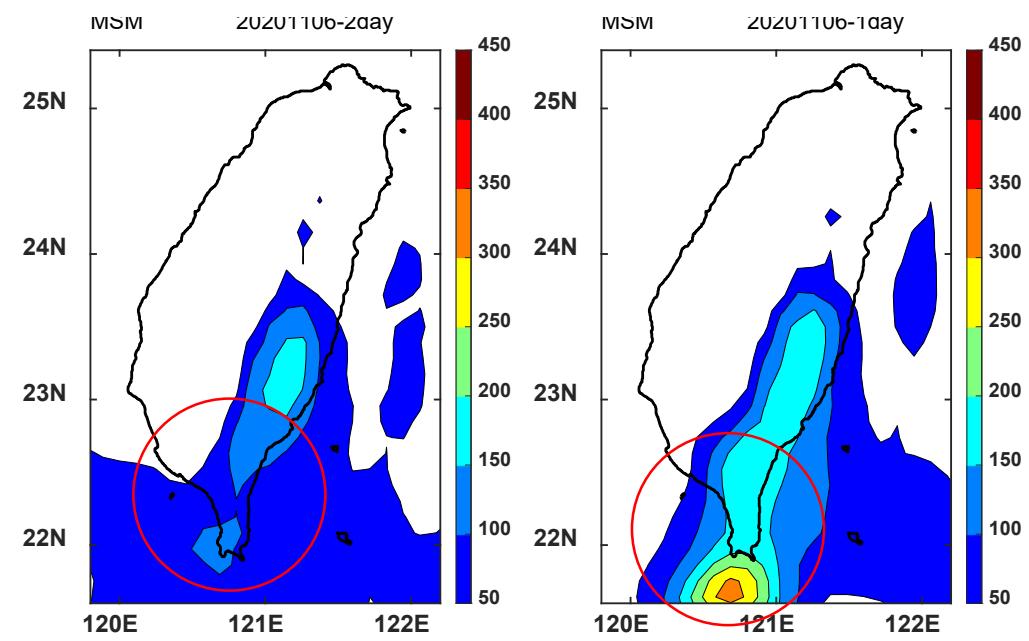
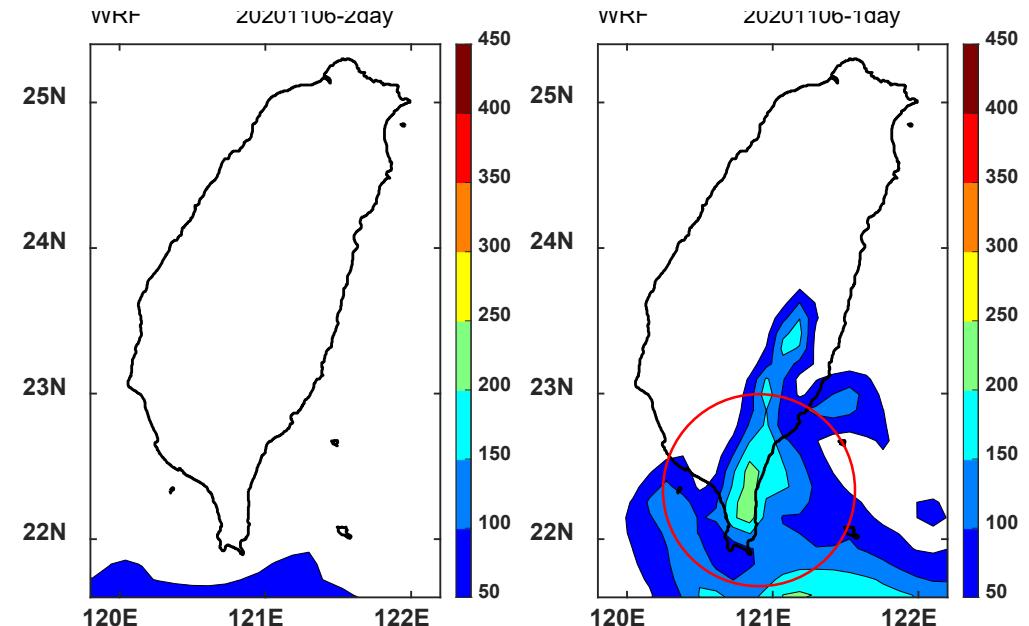
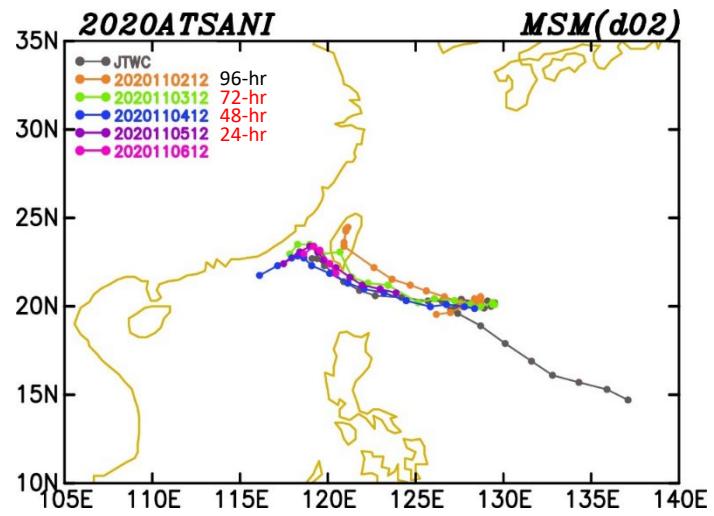
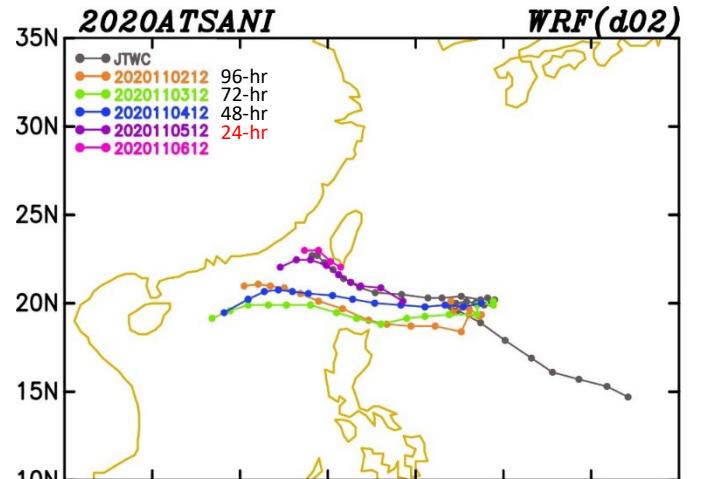
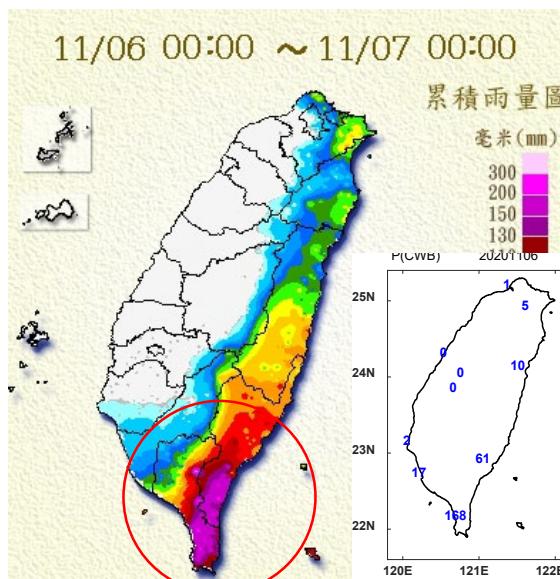
Chanthu (2021)



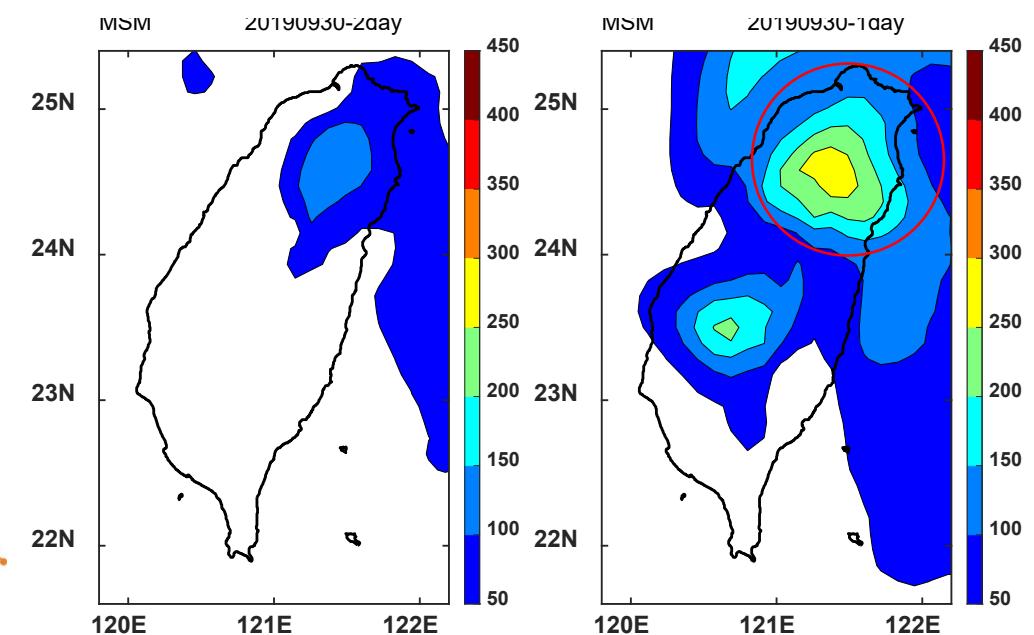
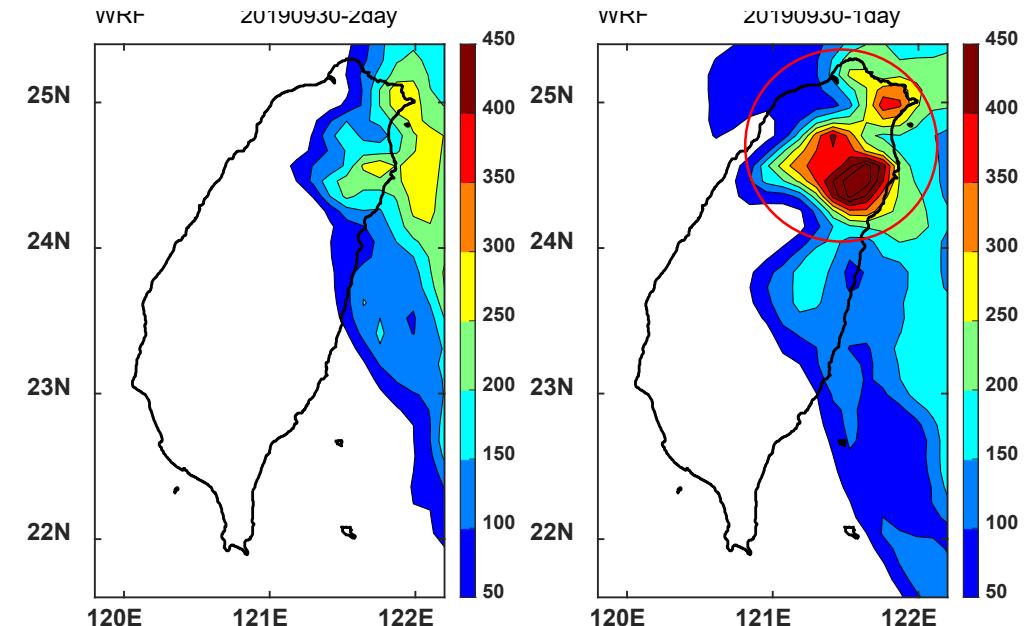
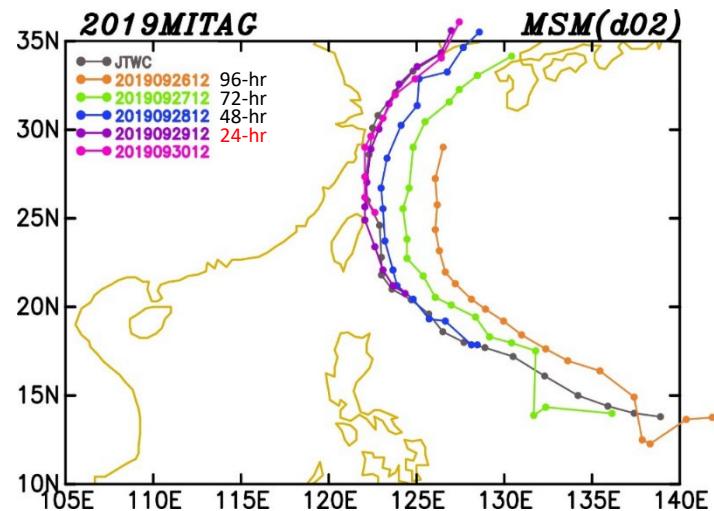
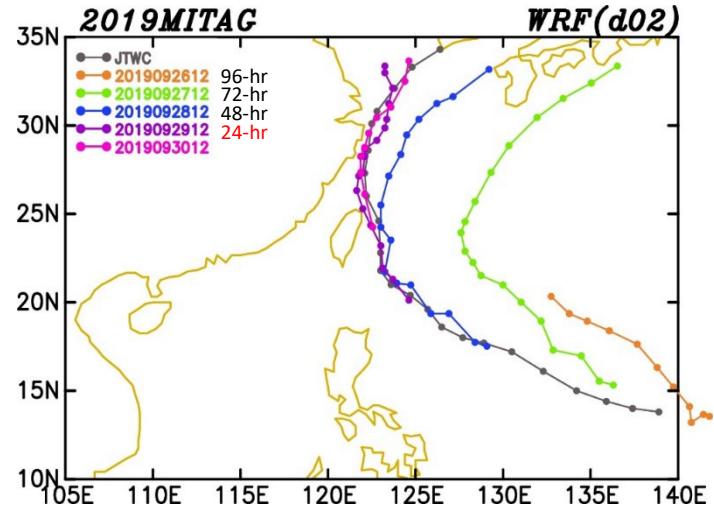
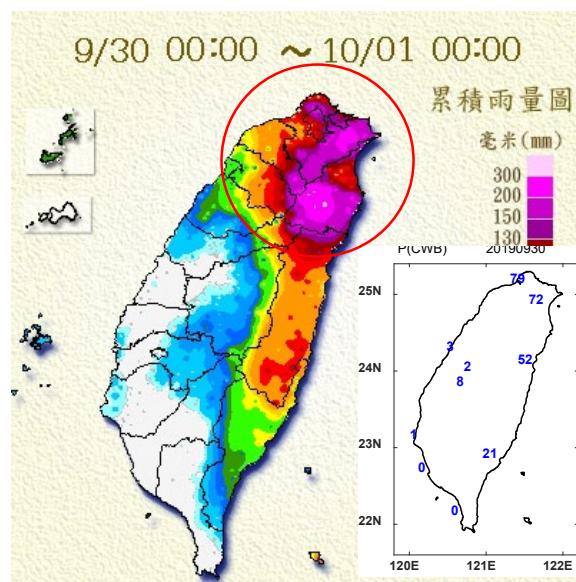
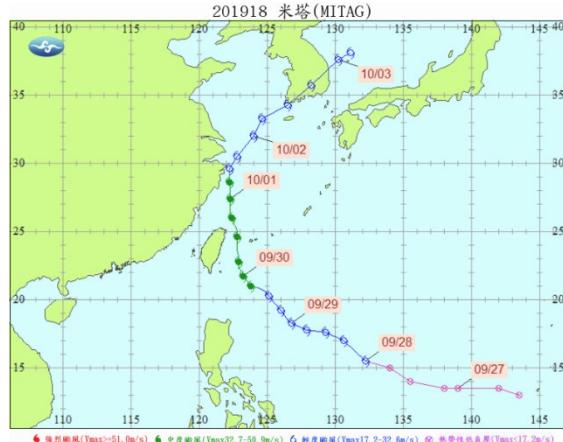
TC Track and Rainfall (1/5)



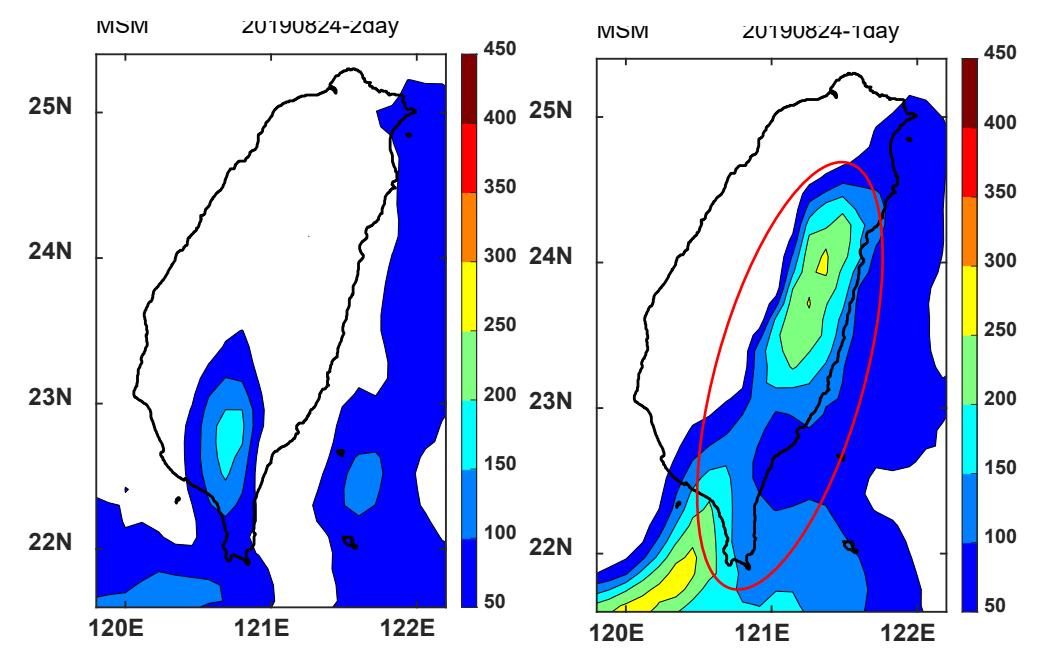
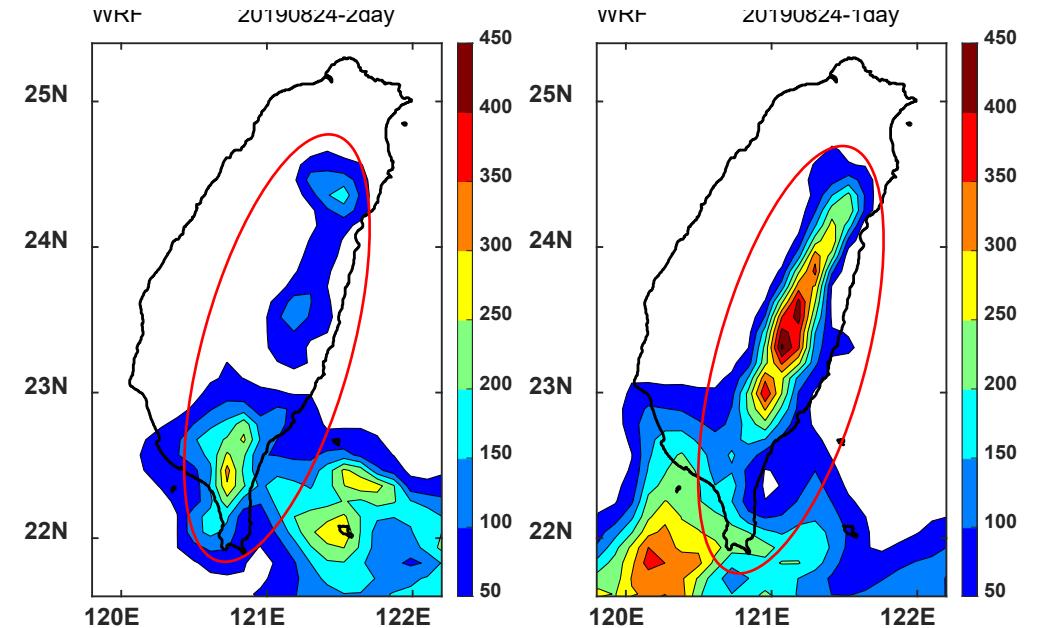
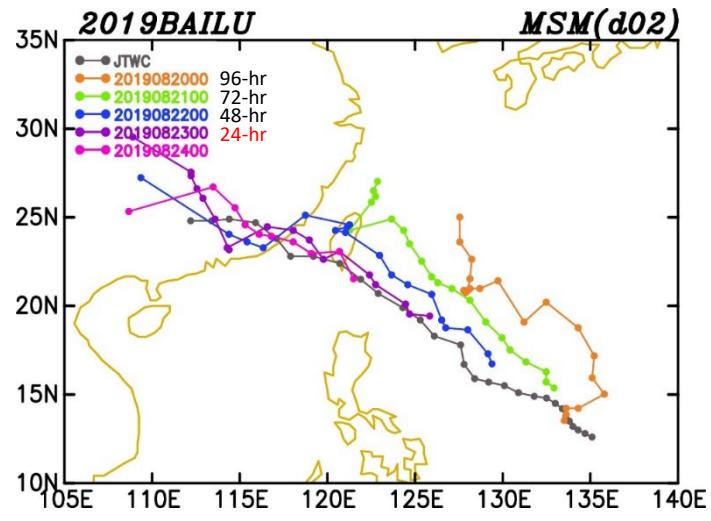
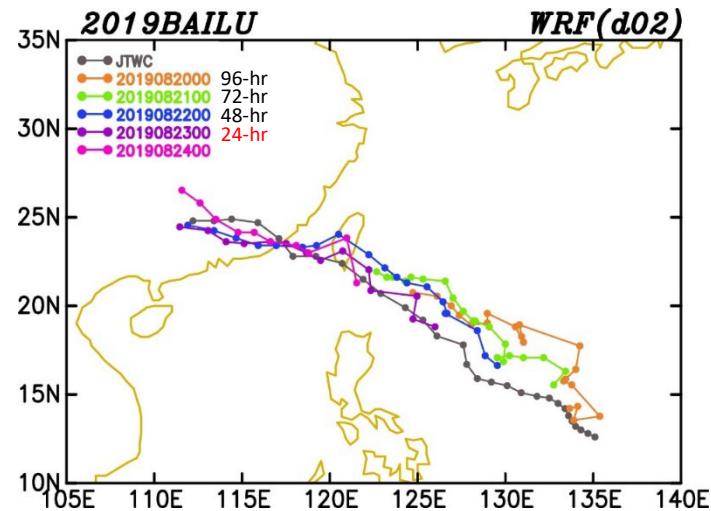
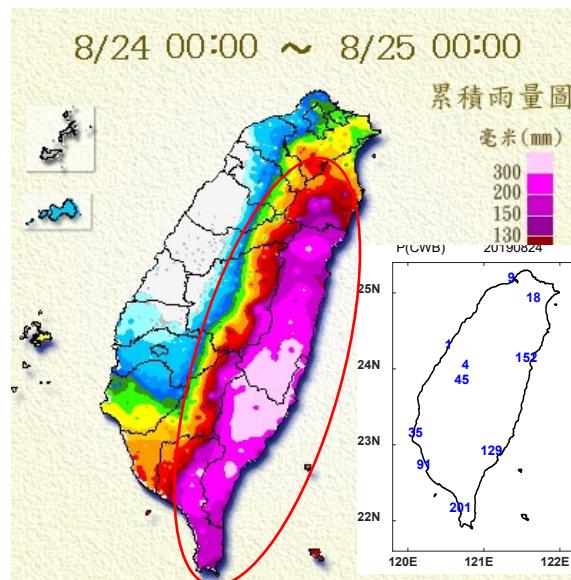
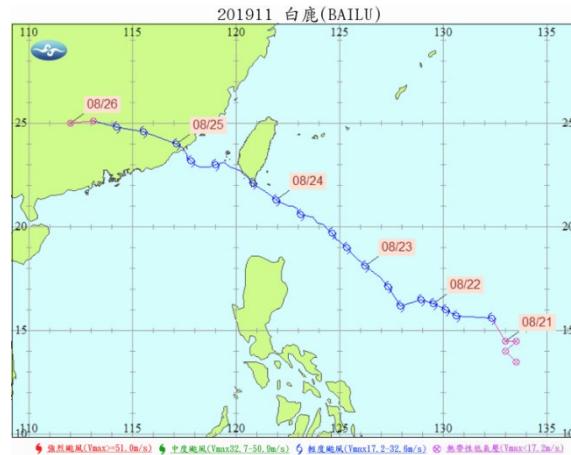
TC Track and Rainfall (2/5)



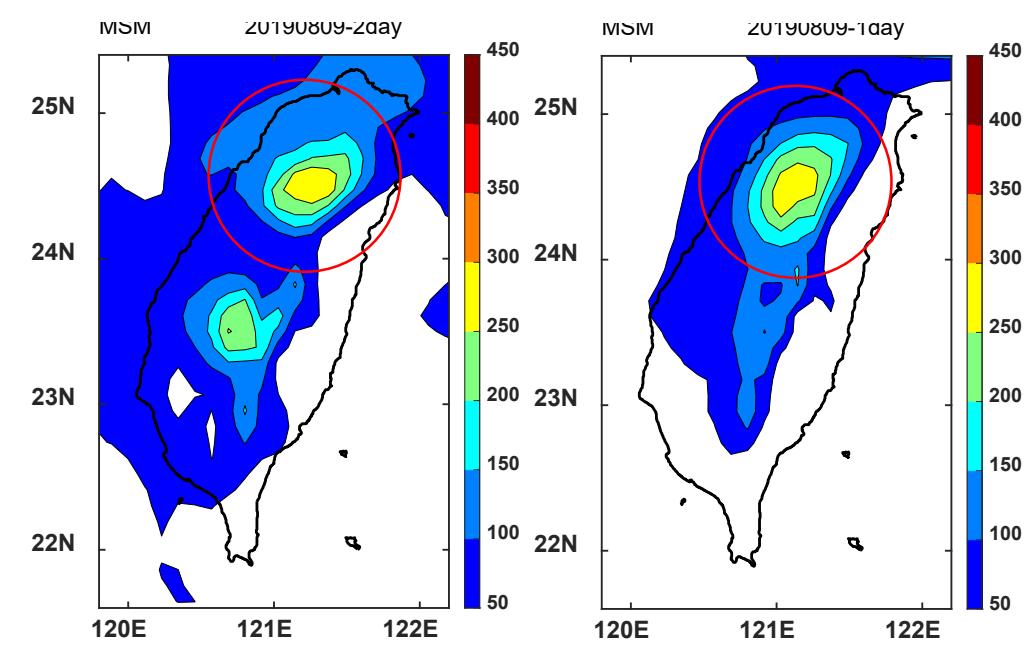
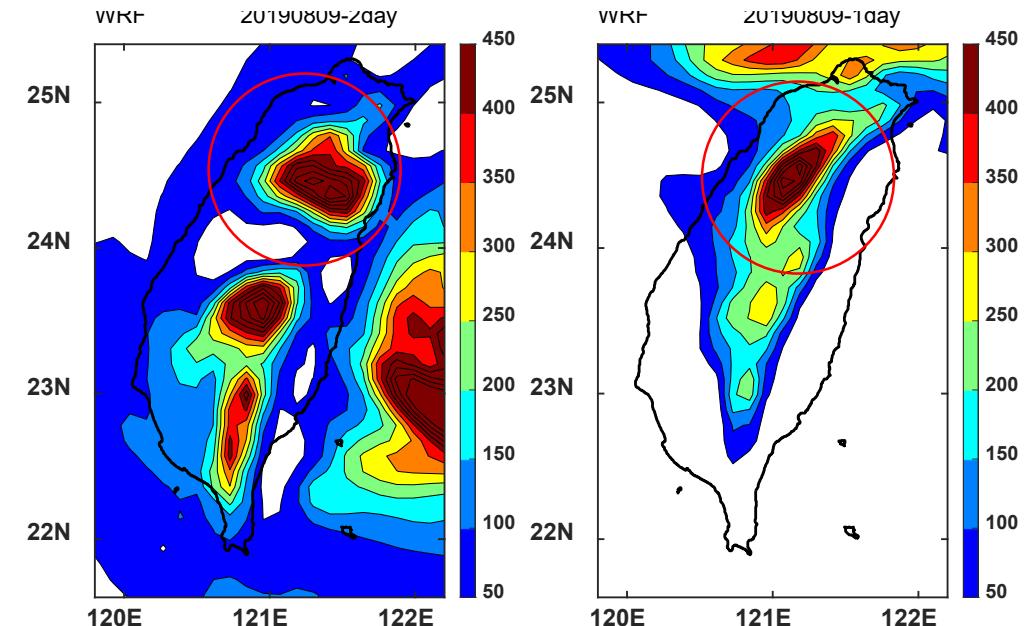
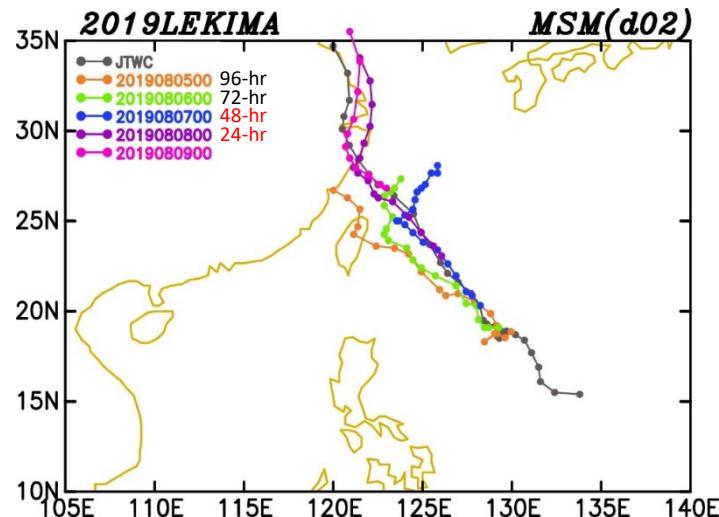
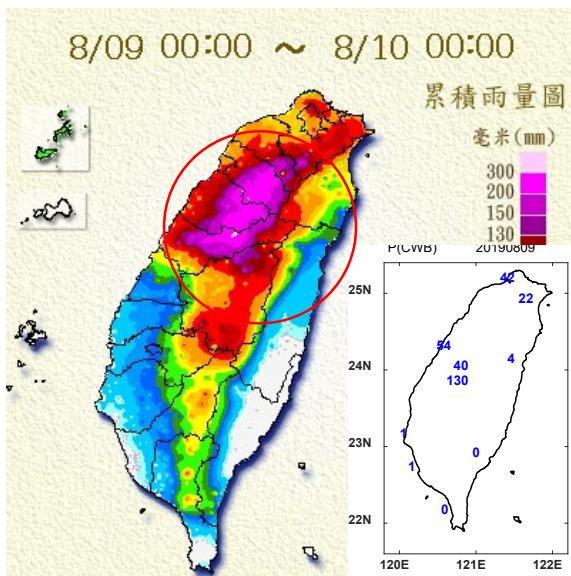
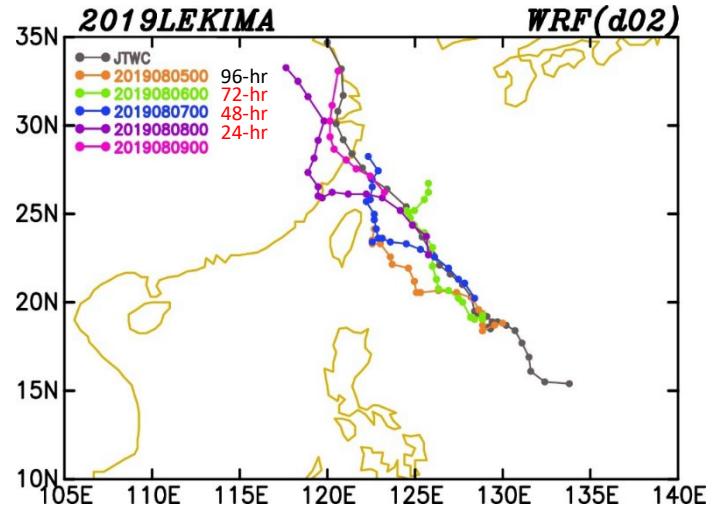
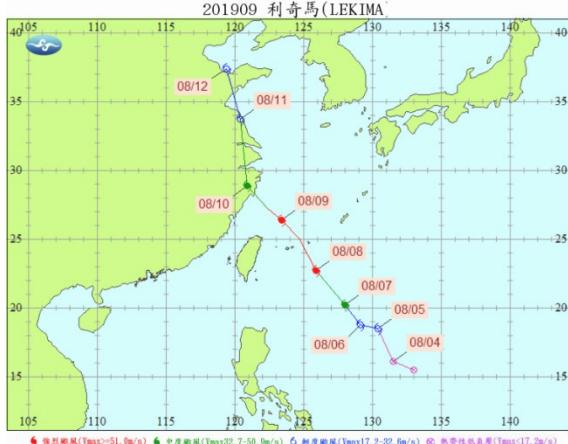
TC Track and Rainfall (3/5)



TC Track and Rainfall (4/5)



TC Track and Rainfall (5/5)



Summary

- TC track forecast is essential to predict associated rainfall.
- Prediction skills
 - Track forecast
 - 1-2 days
 - In some cases, TF can be 3 days
 - Rainfall forecast
 - Basically 1 day
 - In some cases, RF can be 2-3 days

Photographed by W.-T. Li at Kaohsiung Harbor on August 14, 2023.

References

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