

# CLOUD-RESOLVING TIME-LAGGED RAINFALL ENSEMBLE FORECASTS FOR TYPHOONS IN TAIWAN: EXAMPLES OF SAOLA (2012), SOULIK (2013), AND SOUDELOR (2015)

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## ABSTRACT

As high resolution is required for the models to simulate convective storms and thus produce quantitative precipitation forecasts (QPFs) more realistically, time-lagged ensemble out to 8 days at 6-h intervals using a 2.5-km cloud-resolving model is applied to three rainy typhoons that stroke Taiwan in recent years: Saola (2012), Soulik (2013), and Soudelor (2015), following an earlier study.

For the three events where the worst-case scenario turned out to happen in Taiwan, the time-lagged system was able to predict that rainfall scenario with high accuracy (with a fractions skill score of  $\geq 0.86$ ) at a lead time of about 126 h, 55 h, and 164 h before landfall following the order, and thus provided the scenarios useful for early preparation. Near or within the short range ( $\leq 72$  h), as the predicted tracks converged toward the best track, high-quality QPFs were consistently generated since about 36 h, 55 h, and 80 h prior to landfall, respectively, with derived probabilities in good to excellent agreement with the observations even at heavy- to extreme-rainfall thresholds ( $\geq 350$  and 500 mm in 24 h). Associated with this was the markedly increase in probabilities across the various thresholds, again highly informative for decision makers and hazard preparation with enough lead time.

The underlying reason behind our results is the high predictability of topographic rainfall in Taiwan produced by typhoon circulation, which cannot be better captured without high resolution. Thus, without compromising the resolution, the advantages of the time-lagged strategy for ensemble is demonstrated, if QPF is the main parameter sought after by the system. The readers are referred to Wang et al. (2021) for further details of this study.

## REFERENCES

Wang, C.-C., S.-H. Chen, Y.-H. Chen, and K. Tsuboki, 2021: Cloud-Resolving Time-Lagged Rainfall Ensemble Forecasts for Typhoons in Taiwan: Examples of Saola (2012), Soulik (2013), and Soudelor (2015). (manuscript in preparation, to be submitted)

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