Researchers improve western North Pacific tropical cyclone intensity forecasts using the logistic growth equation

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Tropical cyclones (TCs) are humbling and powerful forces of nature that can have tremendous impacts on people and human populations.

Meteorologists have strived to improve TC forecasting skill, hoping to save lives. In the past few decades, TC track forecasts over the western North Pacific (WNP) have progressed considerably. However, TC intensity forecasts have improved insignificantly, with only a 3 to 5 day lead time. Therefore, improving TC intensity forecast skill and extending lead forecast time are important and urgent issues.

To address this critical problem, a research group led by Prof. Ruifen Zhan from the Department of Atmospheric and Ocean Sciences/Institute of Atmospheric Sciences at Fudan University, along with the Shanghai Typhoon Institute of China Meteorological Administration, have developed a new forecasting method that provides more precise TC intensity forecasts. The team just published their findings in *Advances in Atmospheric Sciences*.

"The new scheme also shows the potential for forecasting TC rapid intensification and rapid weakening, and for extending the current 5-day forecast time limit to 7 days," said Prof. Zhan.

Developers based the new approach on the logistic growth equation. They combined step wise regression (SWR), which is essentially a "trial-and-error" method of variable testing, and machine learning (LightGBM) methods using observed and reanalysis data. Results show that the new scheme produces much less significant TC intensity forecast error than the China Meteorological Administration's official intensity forecast, especially for TCs that have impacted coastal regions of East Asia. Researchers also compared new LightGBM-based data with results obtained using the SWR-based method. The LightGBM-based scheme consistently outperformed conventional SWR-based processes.

"Future work may be needed to overcome the problem of insufficient samples by combining the transfer learning methods based on this

research, which is the key whether the new scheme can be used in operational forecasts." added Prof. Zhiwei Wu, a co-author of the study.

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