

Current Status and Future Perspectives of Tropical Cyclone Prediction Using AI-Based Weather Models

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Tropical cyclones are among the most intense natural phenomena occurring worldwide and cause severe disasters almost every year. As global warming progresses, meteorological hazards are expected to intensify, and stronger tropical cyclones may exert even greater impacts on society. Under these circumstances, further improving the accuracy of tropical cyclone prediction is a critically important challenge for protecting the lives and property of people living in affected regions.

In recent years, the development of AI-based weather forecasting technologies has advanced at a remarkable pace. Since late 2022, studies have reported that AI weather models can achieve prediction accuracy comparable to, or even exceeding, that of conventional numerical weather prediction (NWP). While NWP calculates future atmospheric states from the current atmospheric state based on physical laws, AI weather models rely on machine learning to infer future atmospheric conditions by learning from vast amounts of historical atmospheric data.

In tropical cyclone prediction, improvements in track forecasting using AI weather models have attracted particular attention. Several studies have demonstrated that track forecast errors can be reduced by several tens of percent compared with conventional methods. In response to these developments, international intercomparison projects on tropical cyclone prediction using AI weather models have been launched, and efforts to incorporate AI weather models into operational tropical cyclone forecasting are accelerating.

In this presentation, I provide an overview of the current status and future perspectives of tropical cyclone prediction using AI weather models, in a manner accessible to audiences outside the tropical cyclone field.

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