

Shimada, U., 2024: Tropical cyclone intensity forecasting with three multiple linear regression models and random forest classification. *J. Meteor. Soc. Japan*, **102**, <http://doi:10.2151/jmsj.2024-030>.

Plain Language Summary: Operational centers use a single multiple linear regression model as one of the models to predict tropical cyclone (TC) intensity. A new TC intensity forecasting model is developed, in which three multiple linear regression models corresponding to the intensifying, steady-state, and weakening stages of TCs are introduced and in which the weighted mean of the three regression forecasts based on random forest decision trees is computed as a final intensity forecast. Compared to a conventional model, the new model has better accuracy with improvement rates of up to 12%.

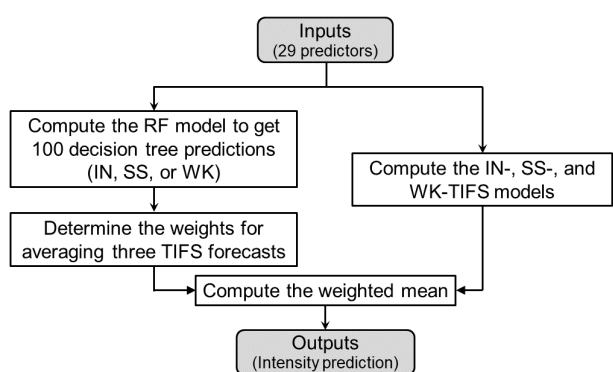


Figure 1. Schematic flow chart of the new model called TIFS-RF. Three multiple linear regression models corresponding to the intensifying (IN-TIFS), steady-state (SS-TIFS), and weakening (WK-TIFS) stages of TCs are introduced and a weighted consensus of the three TIFS forecasts is applied based on random forest (RF) decision trees.

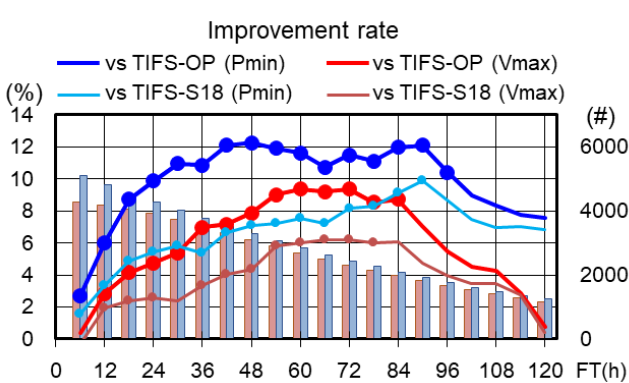


Figure 2. Improvement rates of TIFS-RF central pressure (Pmin) and maximum wind (Vmax) forecast accuracies against a conventional model (TIFS-OP, thick lines) and another conventional model (TIFS-S18, thin lines) forecast accuracies for forecast times (FTs) from 0 h to 120 h. The filled circles indicate statistically significant differences at the 95% level. The bar chart shows the number of samples (right axis, blue for Pmin, brown for Vmax).

- The improvement is particularly significant for steady-state TCs, tropical depressions, and TCs undergoing extratropical transition within five days.
- The accuracy of forecasts is generally better than that of conventional forecasts for rapidly intensifying TCs, but much worse for rapidly weakening TCs.
- This study confirms that a consensus forecast of the new model and Hurricane Weather Research and Forecasting (HWRF) model can overcome the weaknesses of each model used alone.