

Climatic properties of typhoons deduced from Monte Carlo simulation with a data-driven stochastic model

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Typhoons are one of major causes of serious natural disasters in the East Asia region. It is thus important to evaluate the statistical (climatic) properties of typhoon and to assess the risks of typhoon hazards. Since the effect of the climate change during the last several decades is emerging, climatic variations of typhoons would also be important issue. However, since the number of typhoons in each year is small, it is difficult to distinguish between climatic variations and random properties of typhoons.

In order to enable us to evaluate climatic variations of typhoons, we are developing an experimental framework based on a data-driven stochastic simulator. This stochastic simulator is obtained by statistical analysis of the data of past typhoon trajectories for more than sixty years, and it can generate various possible typhoon scenarios under a given condition.

This approach does not consider physical mechanisms of typhoons.

Moreover, at present, the behaviors of the artificial typhoons generated from our stochastic model have some biases probably because of the limitation of the statistical model.

Nonetheless, this approach provides a means of examining qualitative characteristics of the climatic variations of typhoons.

Our stochastic model consists of three modules which describe the three processes: genesis, transition, and dissipation.

Since each of the three modules of our model considers inter-annual variations, we can discuss the effects of each of the three processes on climatic variations of typhoons. In this study, we examine the effects on the frequency of approaching the main islands of Japan.

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