

Estimation and Control of Air-Sea Momentum and Heat Fluxes of Typhoons

Project manager

(selected in 2021) TAKAGAKI Naohisa

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Leader's institution University of Hyogo

R&D institutions

University of Hyogo, Kindai University, Okayama University of Science, Japan Agency for Marine-Earth Science and Technology

Summary of the project

To realize weather control, highly accurate weather forecasting is essential. In particular, for controlling typhoons, there are two bottlenecks: (1) low accuracy of typhoon intensity predictions; (2) difficulty of distinguishing natural and control effects. This project aims to solve these bottlenecks by investigating the mechanism of momentum and heat transfer across the sea surface under typhoons, and formulating the momentum and heat fluxes using parameters associated with wave-breaking and wind waves through a large laboratory experiment for simulating typhoons.

Milestone by the end of project (year 2024)

The momentum and heat fluxes will be measured with a margin of error of 20%, considering wind speeds \leq 40 m/s and fetch distances \leq 30 m. Based on these measurements, empirical equations will be proposed for the fluxes. Subsequently, using a numerical model and the empirical equations, typhoon intensity under artificially varied seasurface conditions will be predicted, which will aid in investigating the probability of altering typhoon intensity (maximum wind speed of a typhoon) by 5% or more.



Project structure

Task 1-1: Generating and controlling the air-water turbulence field with temperature gradient and surface waves at extremely high wind speeds

PI: Naohisa Takagaki (University of Hyogo)

Study of typhoon control techniques using a typhoon simulation water tank

Task 1-2: Typhoon simulations using a novel flux models and suggestions for typhoon control

PI (until April 2023): Naohisa Takagaki (University of Hyogo) PI (from May 2023): Keigo Matsuda (JAMSTEC) Study of typhoon intensity precision and typhoon control techniques

Task 2-1: Air-sea momentum transfer mechanism at extremely high wind speeds

PI (until December 2023): Naoya Suzuki (Kindai University) PI (from April 2024): Naohisa Takagaki (University of Hyogo) Measuring air-sea momentum flux

Task 2-2: Air-sea heat transfer mechanisms at extremely high wind speeds

PI: Koji Iwano (Okayama University of Science) Measuring air-sea heat flux



(University of Hyogo)



(JAMSTEC)



Koji Iwano (Okayama University of Science)



