

Control Theory of Weather-Society Coupling Systems for Supporting Social Decision-Making

Project manager

Yohei Sawada

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leader's institution

The University of Tokyo

R&D institutions

The University of Tokyo, Osaka University, Kyoto University

Summary of the project

In this project, we will achieve the development of a weather control theory to significantly change the future of weather by small external forces, and the acquisition of the ability to accurately predict the social impact of extreme windstorms and floods, which is necessary to reach a consensus on the implementation of weather control. By doing so, we aim to realize a society free from the fear of extreme windstorms by 2050, with weather and social controls based on democratic social decision-making processes.

Milestone by year 2032

- C. We will develop engineering methods that can safely and efficiently bring intervention effects to the real atmosphere and confirm their effectiveness through laboratory experiments.
- D. We will develop socially decisive weather control methods to directly achieve the reduction of damage from flooding.

Milestone by year 2027

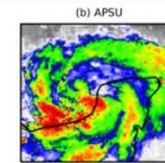
- A. We will propose a method that can control the time evolution of many extreme weather events with small energy and confirm that it is effective enough to consider the uncertainties in weather simulations.
- B. We will realize the integrated prediction of social impacts of extreme weather events, including social dynamics in response to disaster information such as evacuation behavior, and show the uncertainty in the predictions. We will make it possible to evaluate the social impact of weather control and develop a method to make decisions on weather control.

R&D theme structure of the project

R&D Theme A-1:
Construction and analysis of new meteorological data leading to "controllability" and design of control methods

Task 1: Development and analysis of ensemble reanalysis & reforecasting data
Masashi Minamide (Univ. of Tokyo)

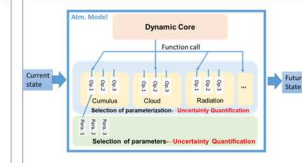
Task 2: Data-driven meteorological controller
Kazumune Hashimoto (Osaka Univ.)



R&D Theme A-2:
Uncertainty quantification for meteorological control

Task 3: Uncertainty quantification of weather-society coupled systems
Yohei Sawada (Univ. of Tokyo)

Task 4: Analyzing uncertainty in physics processes
Kentaro Suzuki (Univ. of Tokyo)



A: Meteorological Control Theory

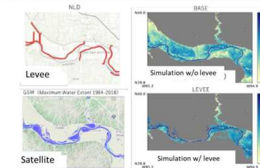
Task force for exploring engineering approach (Project-wide group)

B: Impact-based forecasting

R&D Theme B-1:
Integrated probabilistic forecasting of combined flooding hazards

Task 5: Probabilistic forecasting of River flood hazards
Dai Yamazaki (Univ. of Tokyo)

Task 6: Probabilistic forecasting of storm surge and high wave hazards
Yoshimitsu Tajima (Univ. of Tokyo)



R&D Theme B-2:
Forecasting and controlling social impact and social decision making of weather control

Task 7: Forecast and control of social system dynamics in disasters
Hitomu Kotani (Kyoto Univ.)

Task 8: Economic damage assessment and uncertainty estimation for decision making
Toshio Fujimi (Kyoto Univ.)

Task 9: Exploring possibility of social decision making of weather control
Momoyo Matsuyama (Univ. of Tokyo)

