

Data Assimilation Research Team: Large Ensemble Data Assimilation Experiment

Progress until FY2022

1. Outline of the project

Data Assimilation (DA) Research Team generates ensemble weather forecast data through DA experiment. The above data serves as a crucial foundation for the entire project. For example, the Mathematical Research Team requires more than 1,000 ensemble data to lower the dimensionality of ensemble weather forecasts. DA Research Team will also test the effectiveness of the weather control inputs identified by the Mathematical Research Team in controlling the weather. Additionally, DA Research team will provide ensemble data with and without weather control for the Economic Damage Research Team.

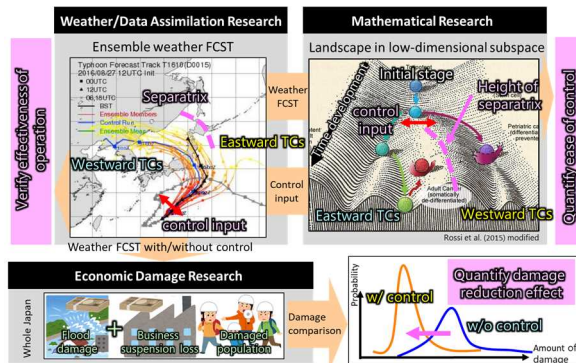


Fig. 1 Relationship btw DA Research Team and other teams

Development items include the following

- Generation of a large ensemble w/ SPEEDY
- Generation of a large ensemble w/ real model.

2. Outcome so far

[Generation of large ensemble with Speedy]

Using the easy-to-handle simple weather model [SPEEDY], DA Research Team has generated training and validation data for the Mathematical Research Team to develop a method to lower the dimensionality of ensemble weather data. The data is generated by assimilating pseudo-observations with an ensemble Kalman filter (EnKF).

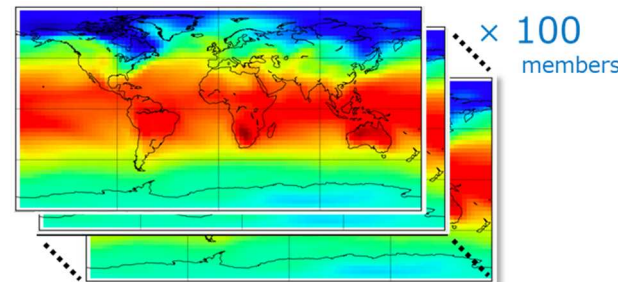


Fig. 2 Image of SPEEDY large Ensemble Data

[Generation of a large ensemble with real model]

DA Research Team has begun building a research environment to create large ensemble data using realistic meteorological models. Since more than 1,000 large ensemble data is required, it is important to secure computing resources. SCALE-LETKF, which has high parallelization efficiency and is suitable for large-scale calculations, will be used for the weather model and data assimilation system. The supercomputers "Wisteria" and "Fugaku" will be used for the computer system.



Supercomputer Fugaku, the photo gallery on the RIKEN website

3. Future plans

DA Research Team will work on creating large ensemble data using real weather models. The ensemble size is expected to be over 1,000 members, and such a large-scale calculation is challenging in terms of computational science. We will provide the large ensemble data to other two research teams in this project to promote their respective research. On the other hand, based on the large ensemble data, we will evaluate the effect of the weather control operations specified by the Mathematical Research Team into the weather model.

This is an important development theme that promotes the technological development for the goals of this project, "quantification of weather controllability" and "quantification of mitigatable damage" by weather control.