

EGU22-7089

<https://doi.org/10.5194/egusphere-egu22-7089>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Control simulation experiment for a typhoon case with a global numerical weather prediction system

Koji Terasaki¹ and Takemasa Miyoshi²

¹RIKEN Center for computational science, Kobe, Japan (koji.terasaki@riken.jp)

²RIKEN Center for computational science, Kobe, Japan (takemasa.miyoshi@riken.jp)

The earth's atmosphere is a nonlinear and chaotic system. A small difference in the initial condition makes forecast different due to the chaos, the characteristics known as the "butterfly effect". The predictability has been improved by the development of the NWP model, data assimilation, and observations for a long time. However, severe weather such as typhoon and torrential rainfall is a threat for us. Weather modification has also been investigated, such as cloud seeding and rain enhancement. It distributes cloud condensation nuclei and enhances cloud formation based on the microphysical processes. Alternatively, this study explores to control a typhoon by taking advantage of the chaotic dynamics.

The Observing System Simulation Experiment (OSSE) is a widely used approach in data assimilation research. We extend the OSSE to what we call the control simulation experiment (CSE) which changes the nature state to the desired direction by adding control signals determined by the ensemble forecasts. This study targets a typhoon, which generated over the Northwest Pacific and hit Japan. We perform CSEs to weaken the typhoon, i.e., making the central sea level pressure (SLP) higher. We apply the control only to the horizontal wind field at the first model vertical layer. Here, we limit the control signal only to reduce the kinetic energy because it would be difficult to increase kinetic energy in a real-world intervention. The CSE is found effective, i.e., we successfully weaken the typhoon when it reaches Japan. We will present the most recent results at the meeting.