Earth system, Climate change, Weather forecast　　Kashiwa Campus S104

TOKUDA LAB.

Decipher the chaos of the Earth system from the land

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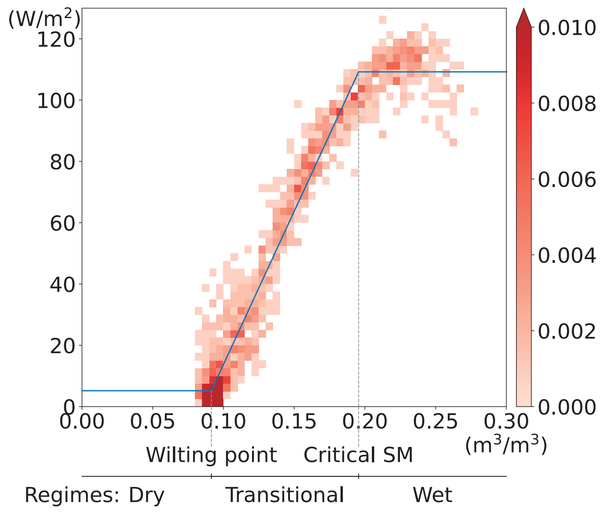
Predicting the Weather and Climate of the Earth

Reliable predictions of weather and climate are essential for effective planning and decision-making. Achieving this requires a comprehensive understanding of the Earth system from past to present, as well as the development of models capable of forecasting future conditions.
However, such predictions are challenging due to the chaotic nature of the atmospheric system, in which small differences in initial conditions can lead to large variations in outcomes.
This lab explores approaches to understanding and reducing the effects of atmospheric chaos by focusing on land surface processes, which exhibit greater inertia than the atmospheric processes.

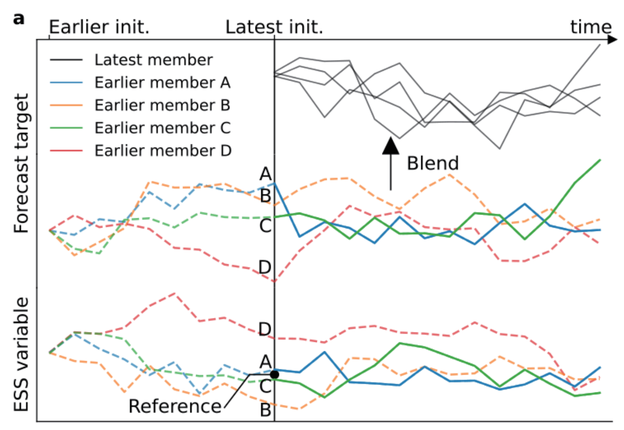
Understanding the “Habits” of Models

What will the Earth’s temperature be in the year 2100? How much rainfall can we expect? Around the world, researchers are developing models to answer these questions. Our research has revealed that the unique characteristics of land components in each model play a major role in shaping the overall outcomes of those predictions.



Enhancing Weather Forecasts Through Post-Processing

Will the weather be warmer or colder three weeks from now?
The weather forecasts we rely on every day are produced through systems that require significant economic and computational resources. Our research has developed a method to improve the accuracy of these forecasts by applying a simple adjustment process after the initial forecast has been made. This approach, known as post-processing, requires only minimal additional effort and has proven effective to multiple forecasting models.



Converting Atmospheric Forecasts into Land Water Information

Forecasts of air temperature and rainfall, as well as information about the amount of river flow, water stored in lakes, marshes, and reservoirs, and the temperature of that water, are essential for both disaster preparedness and economic planning. We are developing a simulation model—the only one of its kind in the world—that can represent the dynamics in land and water systems. This allows us to better understand and anticipate water risks.