
Long-term potential predictability of regional extreme events in East Asia estimated from a high-resolution large ensemble

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Abstract

Compared to the high predictability of seasonal forecasts in the tropics, predictability in the mid- and high- latitudes is low due to the high atmospheric noise and low signal-to-noise ratio. Large ensemble prediction is one solution to reduce noise by taking the ensemble average. Despite the enormous computational cost issues, a large ensemble is also a powerful tool for capturing rare extreme weather and climate events.

Here, we will present our recent studies using high-resolution large ensemble simulations, so-called d4PDF (database for Policy Decision making for Future climate change), focusing on the potential predictability of extreme event probability. The large ensemble simulations were carried out by the global atmospheric general circulation model with a horizontal resolution of 60 km and the regional climate model around East Asia with a horizontal resolution of 20 km, which were prescribed by the observed SST. The dataset covers more than 6000 years (100 members from 1951 to the present). Using this dataset, we confirmed that a large ensemble improves temporal anomaly correlation skills over land at the mid-latitudes. Furthermore, the high-resolution 20-km runs can reproduce local heavy rainfall affected by fine topography and mesoscale rainfall systems. By combining global and regional simulations, we found that large-scale slow tropical ocean variability affects the frequency of local heavy rainfall, and local terrain sometimes helps to reduce atmospheric noises, resulting in higher potential predictability of rainfall in some areas in East Asia.

We will also introduce our decadal prediction system operated by Meteorological Research Institute (MRI), Japan Meteorological Agency (JMA).

Keywords: a high, resolution large ensemble, seasonal, to, decadal prediction

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