EGU24-1548, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-1548
EGU General Assembly 2024

Prediction Skill and Practical Predictability Depending on the Initial Atmospheric States in S2S Forecasts

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The hypothesis that predictability depends on the atmospheric state in the planetary-scale low-frequency variability in boreal winter was examined.We first computed six typical weather patterns from 500-hPa geopotential height anomalies in the Northern Hemisphere using self-organizing map (SOM) and k-clustering analysis. Next, using 11 models from the subseasonal-to-seasonal (S2S) operational and reforecast archive, we computed each model's climatology as a function of lead time to evaluate model bias. Although the forecast bias depends on the model, it is consistently the largest when the forecast begins from the atmospheric state with a blocking-like pattern in the eastern North Pacific. Moreover, the ensemble-forecast spread based on S2S multimodel forecast data was compared with empirically estimated Fokker– Planck equation (FPE) parameters based on reanalysis data. The multimodel mean ensemble-forecast spread was correlated with the diffusion tensor norm; they are large for the cases when the atmospheric state started from a cluster with a blocking-like pattern. As the multimodel mean is expected to substantially reduce model biases and may approximate the predictability inherent in nature, we can summarize that the atmospheric state corresponding to the cluster was less predictable than others.