Subseasonal Representation and Predictability of North American Weather Regimes

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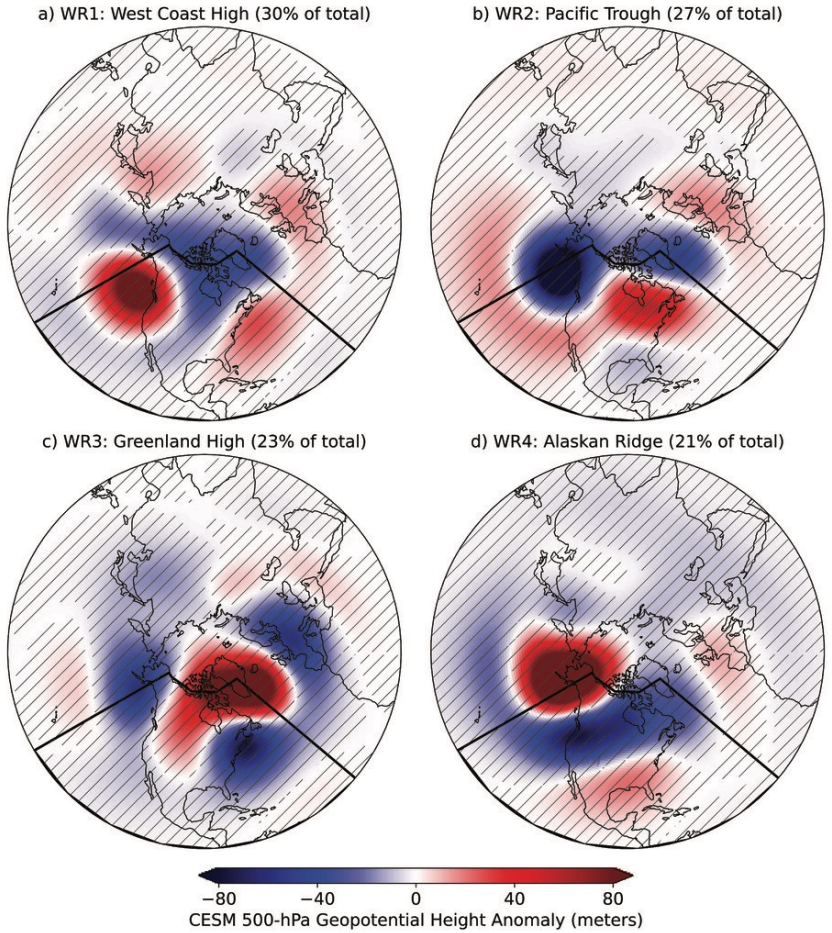

OBJECTIVE

Assess representation and predictability of North American weather regimes, and potential sources and limits of predictability.

APPROACH

North American weather regimes are extracted from ERA5 using unsupervised machine learning (k-means clustering). The representation of these weather regimes in an ensemble of initialized subseasonal hindcasts from CESM2 are assessed. Upstream patterns associated with higher and lower predictability were analyzed.

IMPACT

Several reforecasts were skillful and exhibited high predictability during later lead times, which could be partly attributed to skillful representation of the atmosphere from the tropics to extratropics upstream of North America. High predictability for several case-study examples manifested as an “ensemble realignment,” in which most ensemble members agreed on a prediction despite ensemble trajectory dispersion during earlier lead times. This study further demonstrates that unsupervised learning methods can be used to uncover sources and limits of subseasonal predictability, along with systematic biases present in numerical prediction systems.