Geophysical Research Abstracts
Vol. 16, EGU2014-2113, 2014
EGU General Assembly 2014

The seasonal predictability of blocking frequency in two seasonal prediction systems (CMCC, Met-Office) and the associated representation of low-frequency variability.

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Low-frequency variability is a fundamental component of the atmospheric circulation. Extratropical teleconnections, the occurrence of blocking and the slow modulation of the jet streams and storm tracks are all different aspects of low-frequency variability. Part of the latter is attributed to the chaotic nature of the atmosphere and is inherently unpredictable. On the other hand, primarily as a response to boundary forcings, tropospheric low-frequency variability includes components that are potentially predictable. Seasonal forecasting faces the difficult task of predicting these components. Particularly referring to the extratropics, the current generation of seasonal forecasting systems seem to be approaching this target by realistically initializing most components of the climate system, using higher resolution and utilizing large ensemble sizes.

Two seasonal prediction systems (Met-Office GloSea and CMCC-SPS-v1.5) are analyzed in terms of their representation of different aspects of extratropical low-frequency variability. The current operational Met-Office system achieves unprecedented high scores in predicting the winter-mean phase of the North Atlantic Oscillation (NAO, corr. 0.74 at 500 hPa) and the Pacific—N. American pattern (PNA, corr. 0.82). The CMCC system, considering its small ensemble size and course resolution, also achieves good scores (0.42 for NAO, 0.51 for PNA). Despite these positive features, both models suffer from biases in low-frequency variance, particularly in the N. Atlantic. Consequently, it is found that their intrinsic variability patterns (sectoral EOFs) differ significantly from the observed, and the known teleconnections are underrepresented.

Regarding the representation of N. hemisphere blocking, after bias correction both systems exhibit a realistic climatology of blocking frequency. In this assessment, instantaneous blocking and large-scale persistent blocking events are identified using daily geopotential height fields at 500 hPa. Given a documented strong relationship between high-latitude N. Atlantic blocking and the NAO, one would expect a predictive skill for the seasonal frequency of blocking comparable to that of the NAO. However, this remains elusive. Future efforts should be in the direction of reducing model biases not only in the mean but also in variability (band-passed variances).