Atmospheric and Environmental Research

Improved winter forecasts using a new snow index

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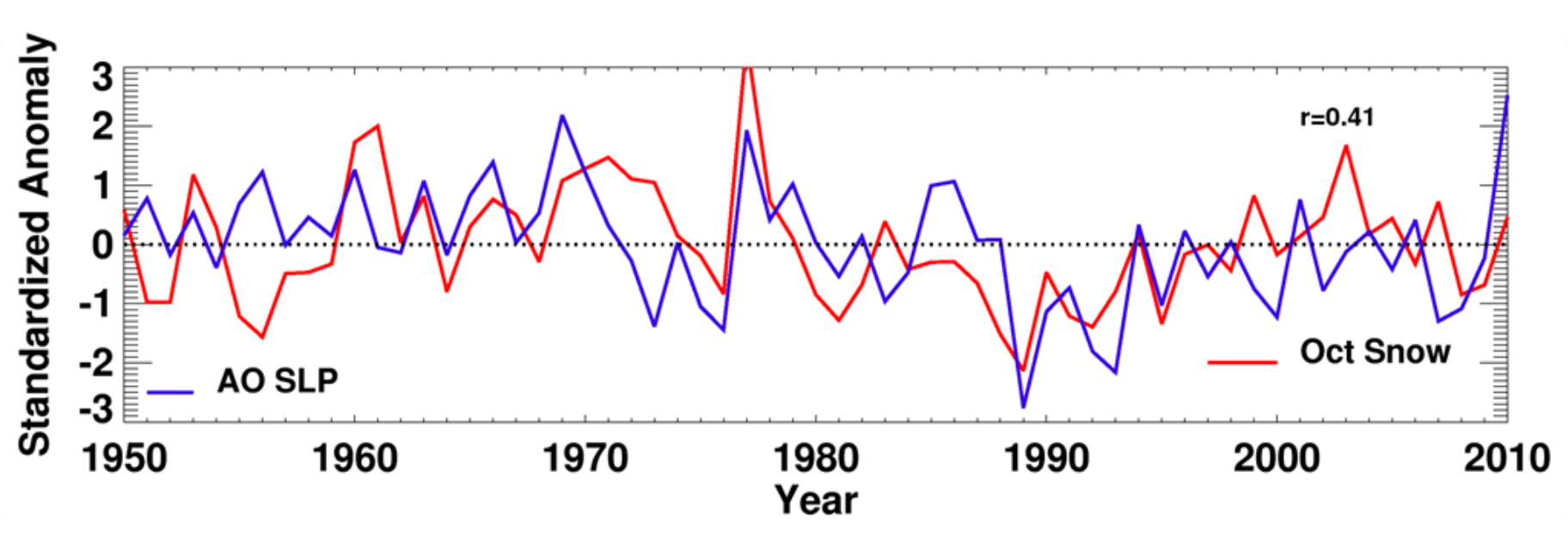
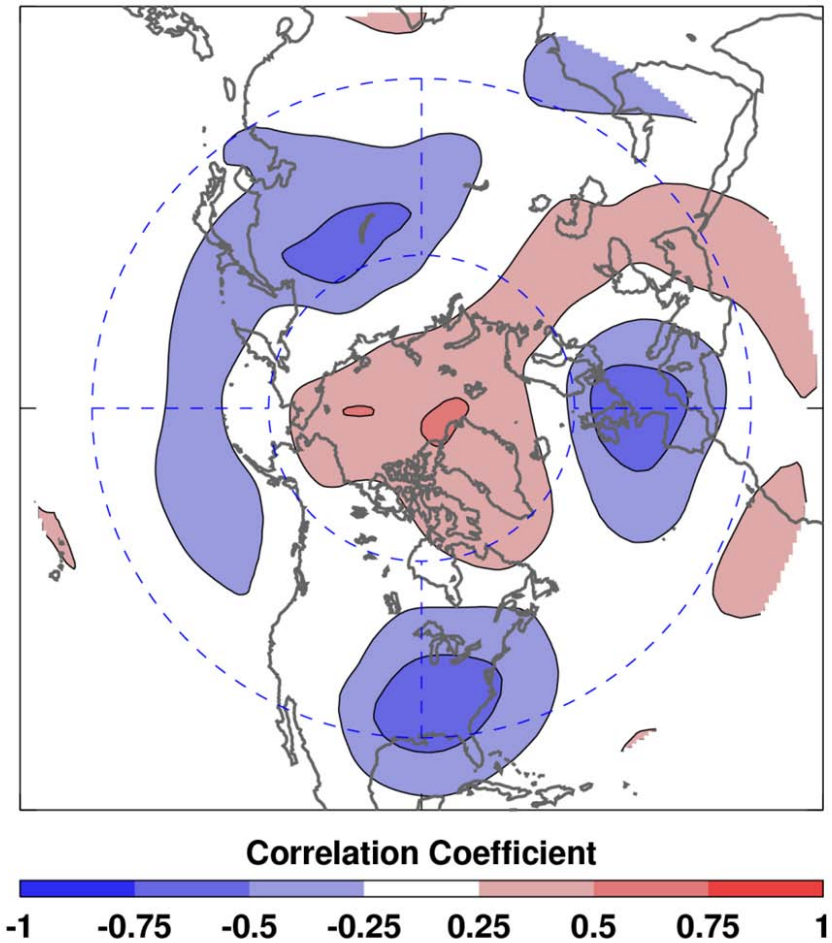
Simple Correlation Suggests Snow – Arctic Oscillation (AO) Relationship



- Uses monthly values
- Includes all of Eurasia
- Measures snow cover extent

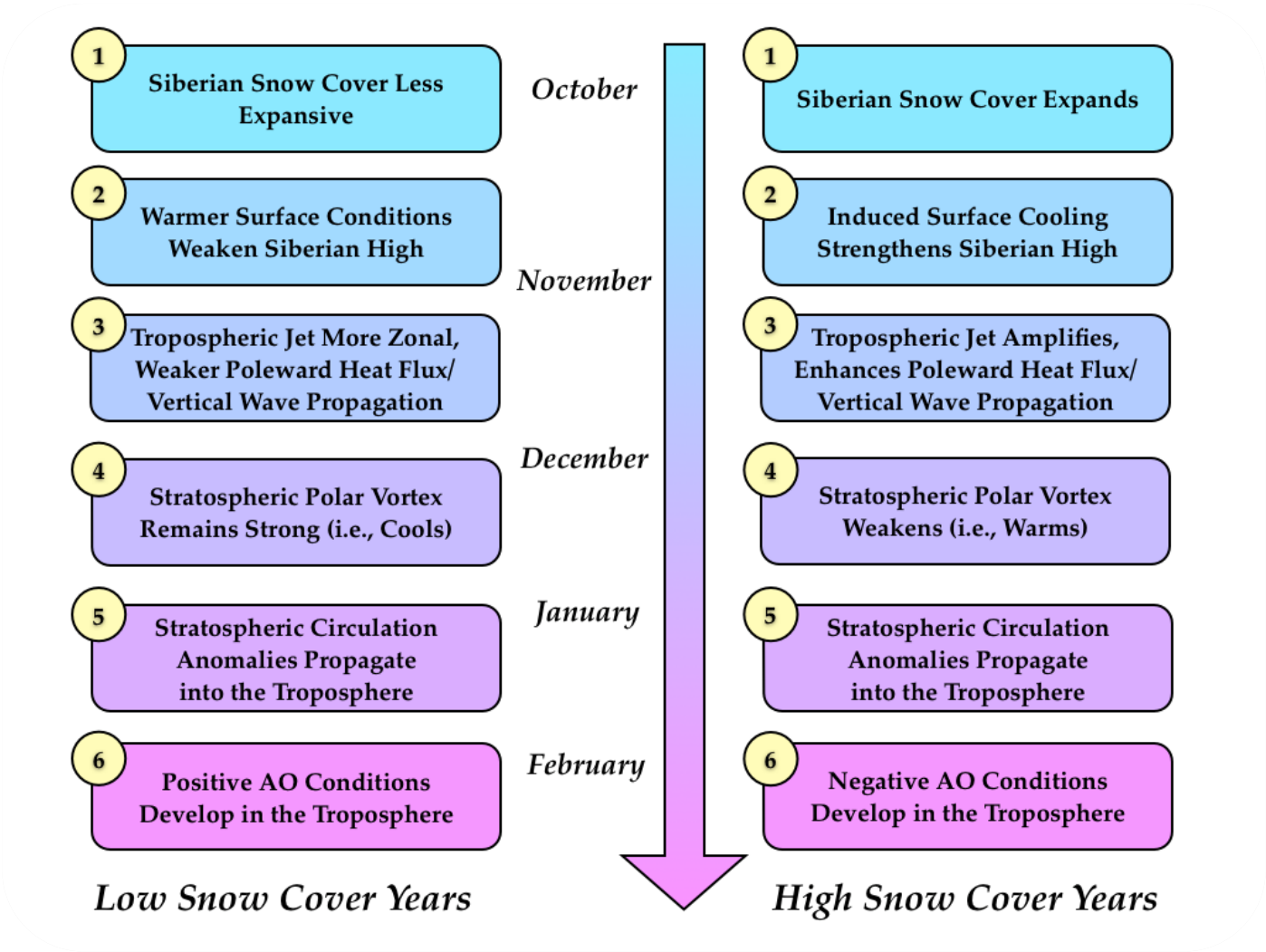
Cohen and Entekhabi (1999)

Tropospheric response to snow forcing



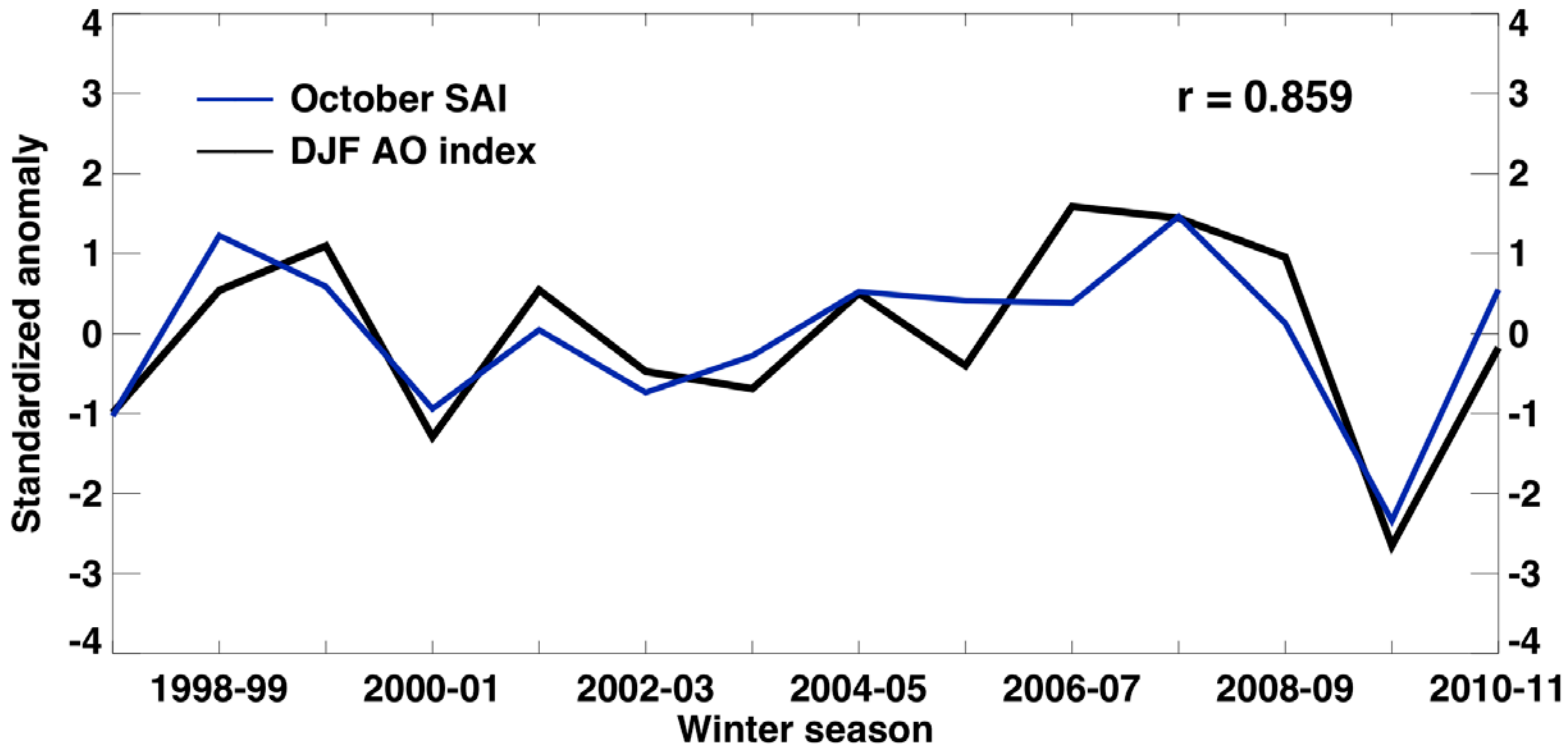
Cohen and Entekhabi (1999)

Climate response to snow forcing



Cohen et al (2007)

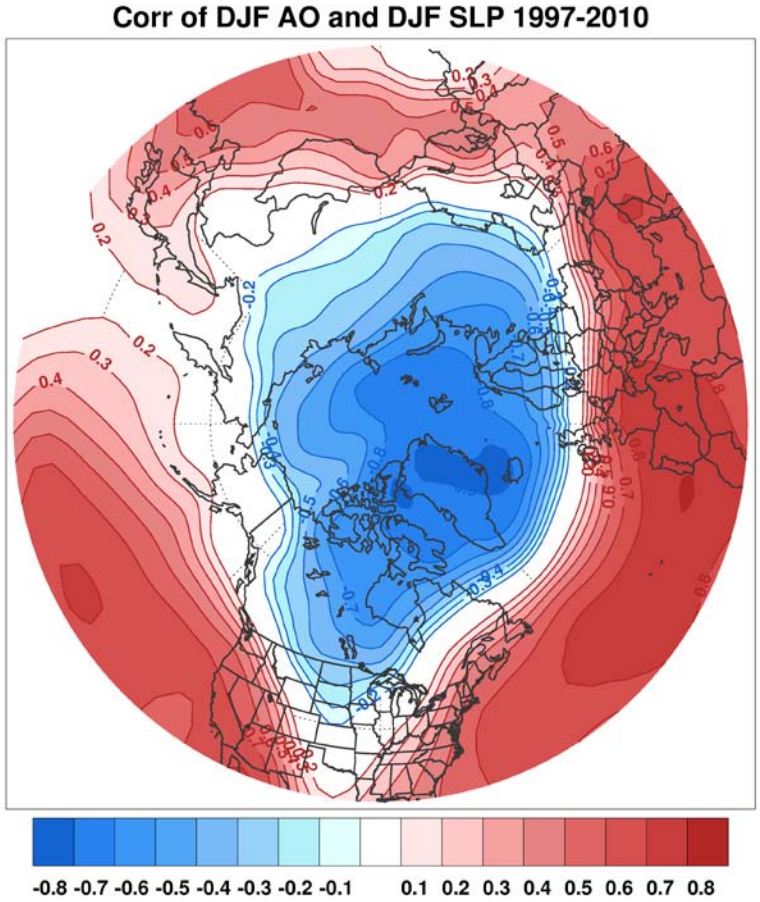
Snow Advance Index (SAI)

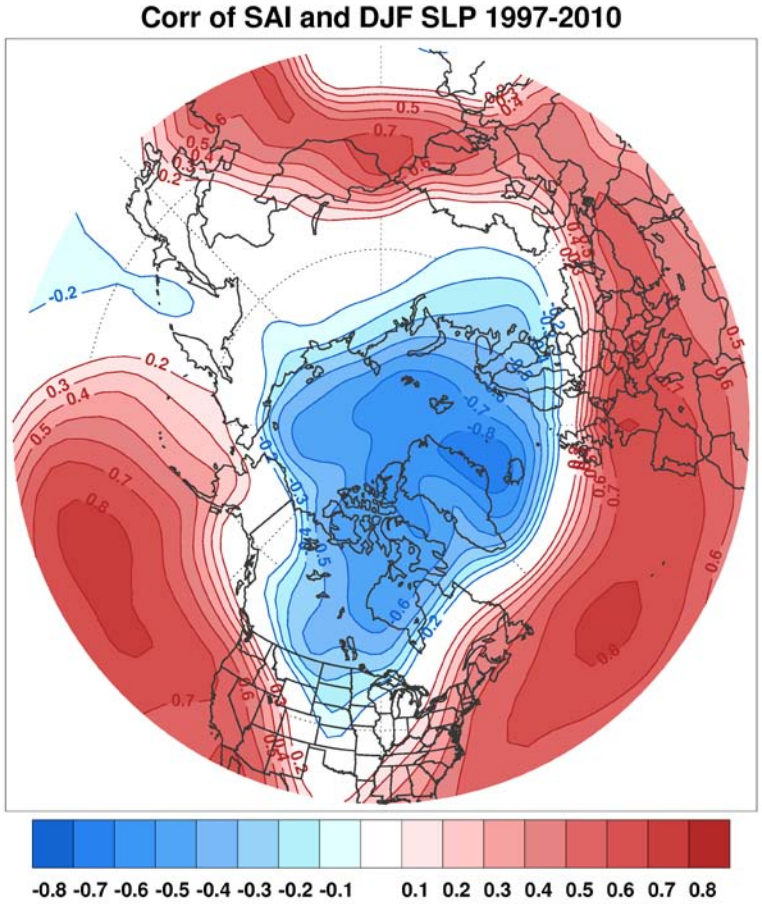


- Uses daily values
- Limited to equatorward of 60°N
- Measures rate of change of snow cover

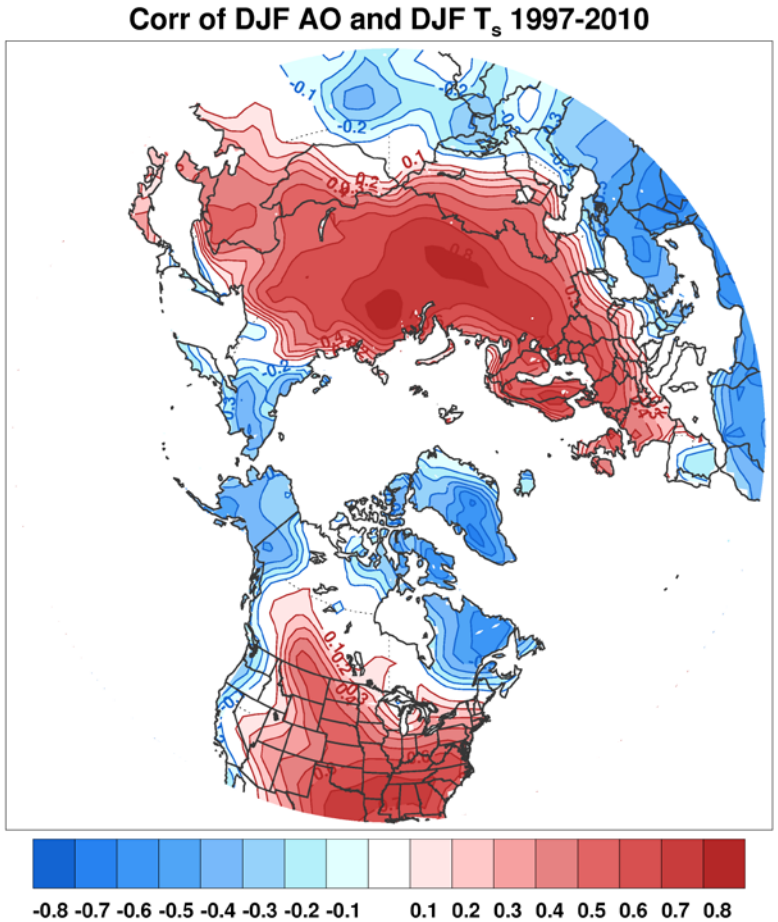
Cohen and Jones (2011)

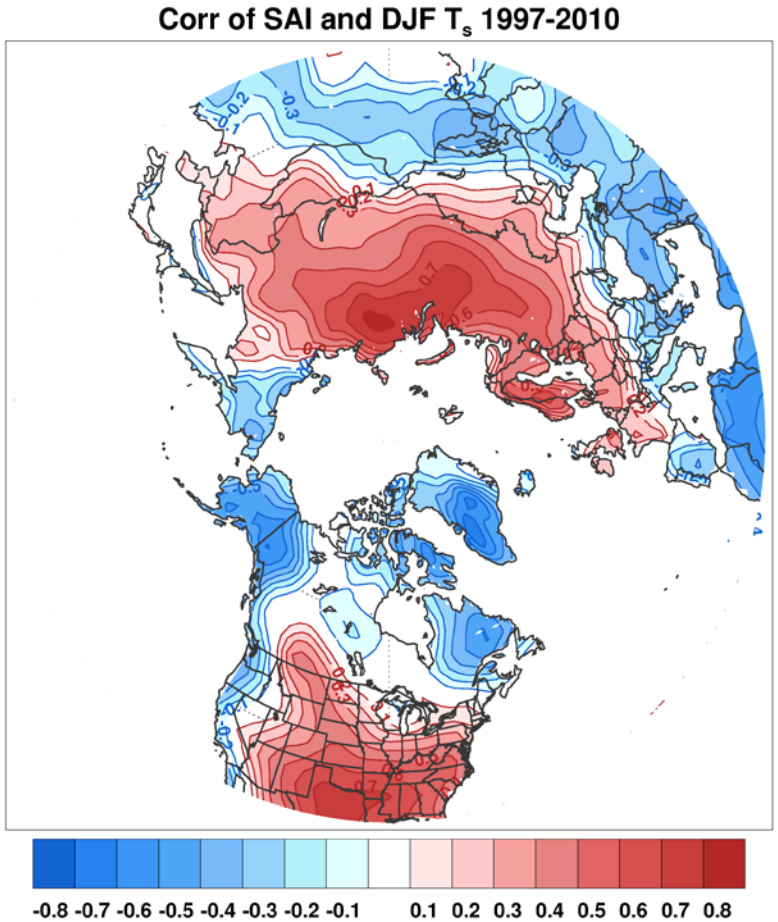
Correlations with sea level pressure



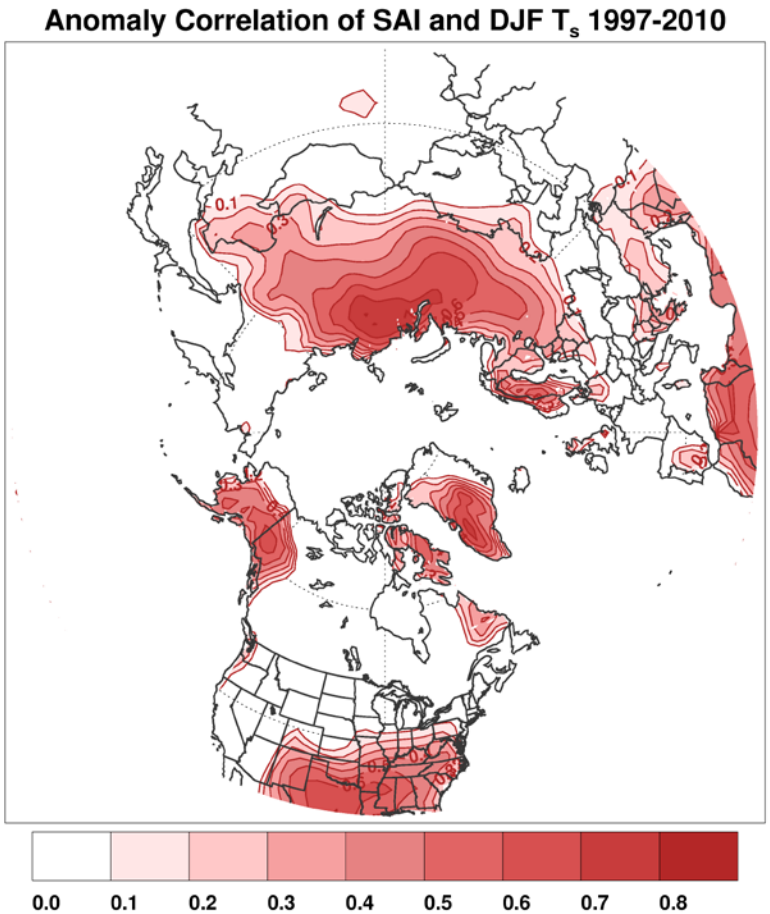


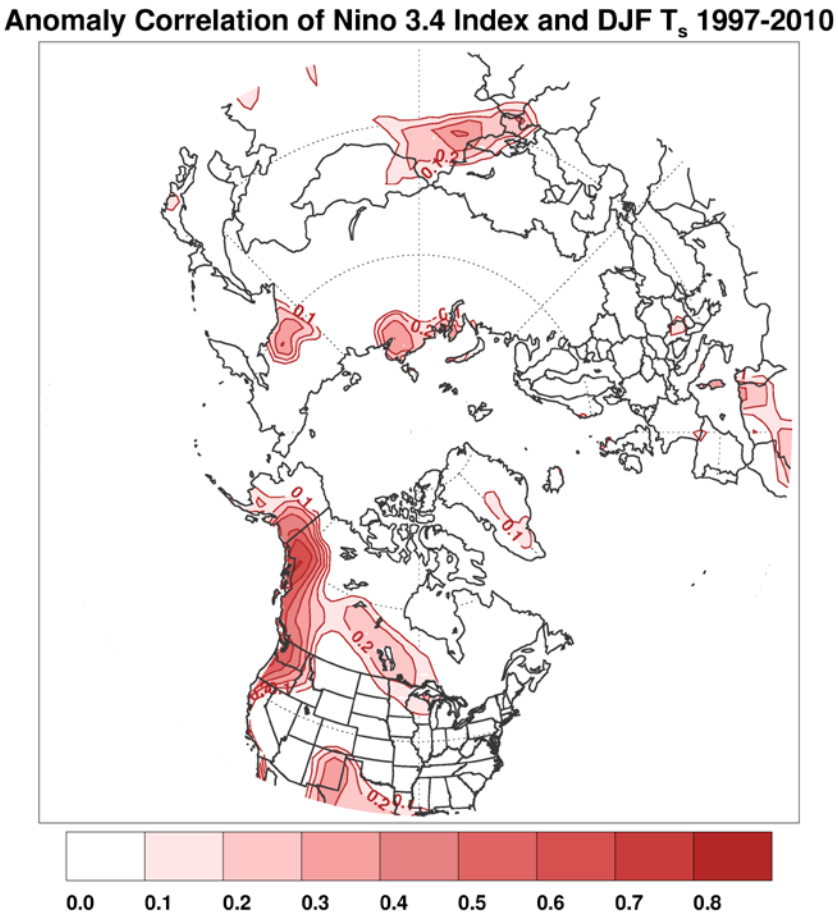
Correlations with surface temperature



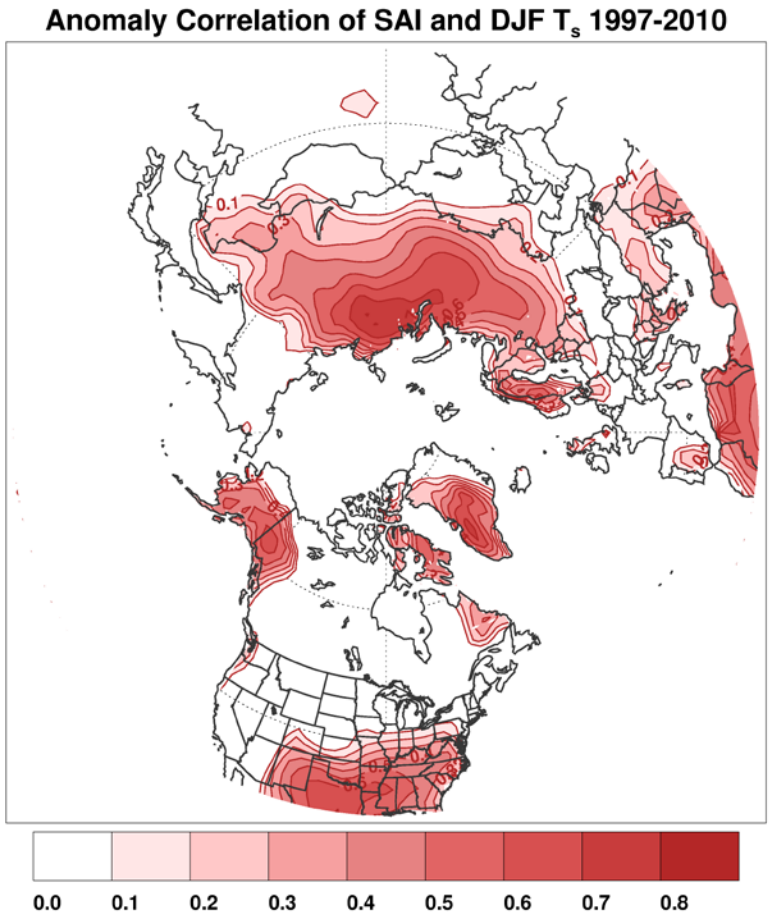


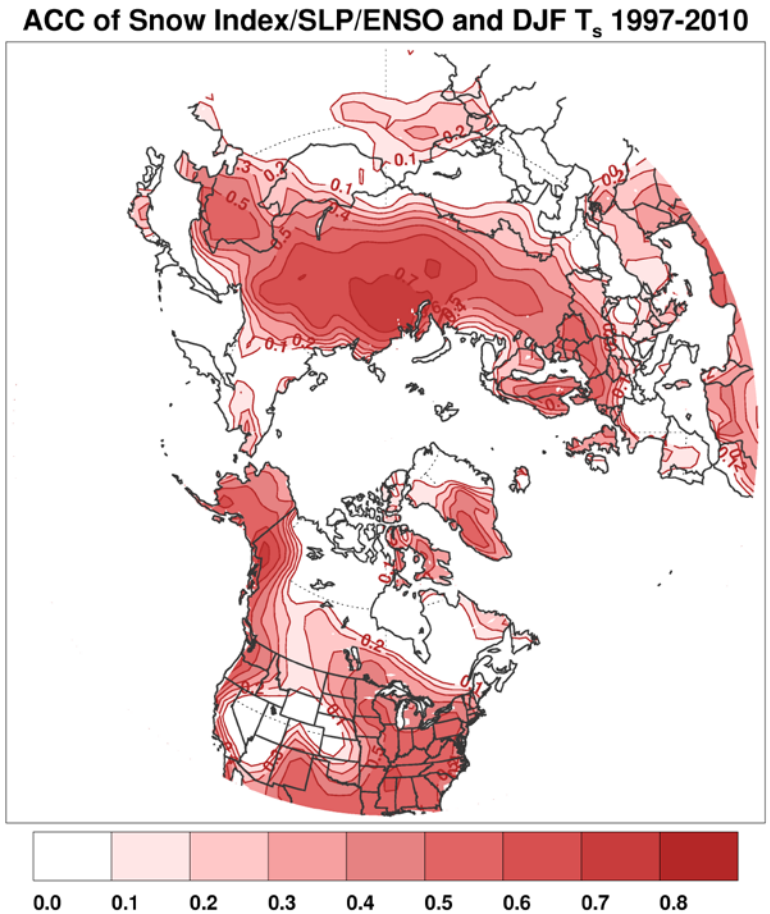
Anomaly correlations of cross validated hindcasts



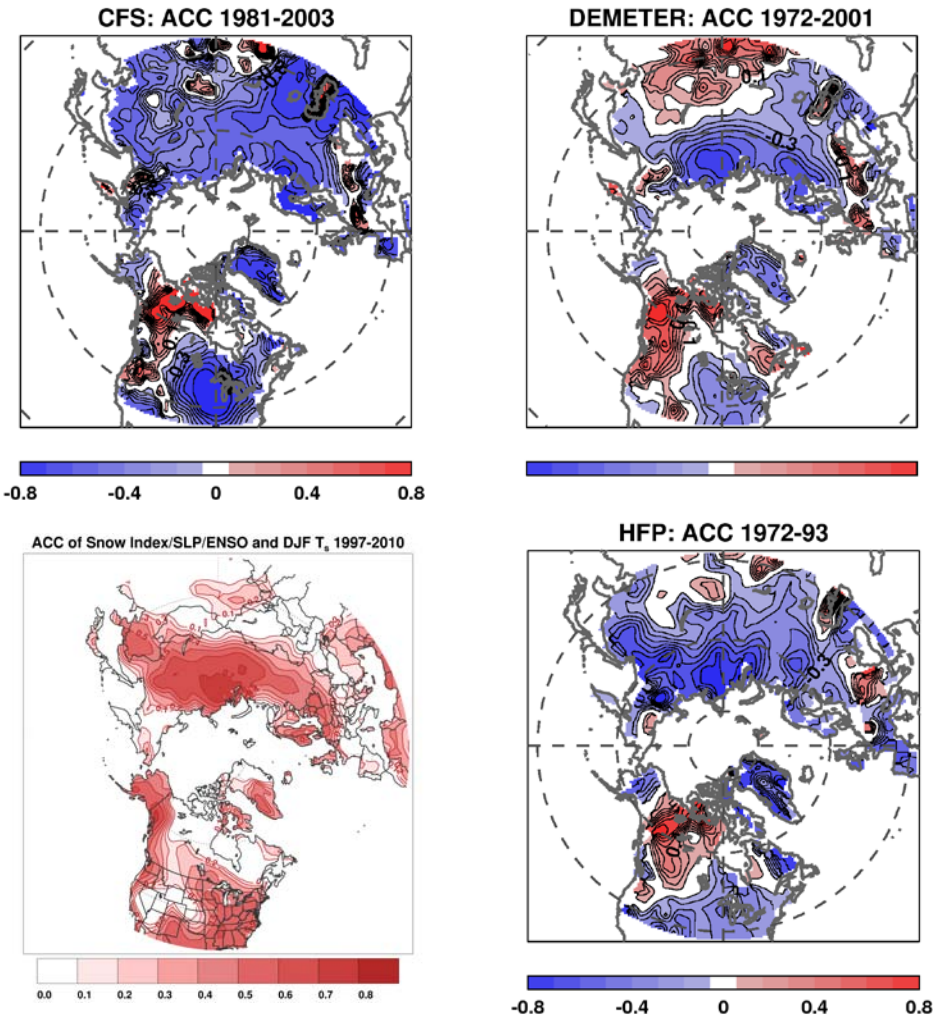


Anomaly correlations of cross validated hindcasts with a simple statistical model



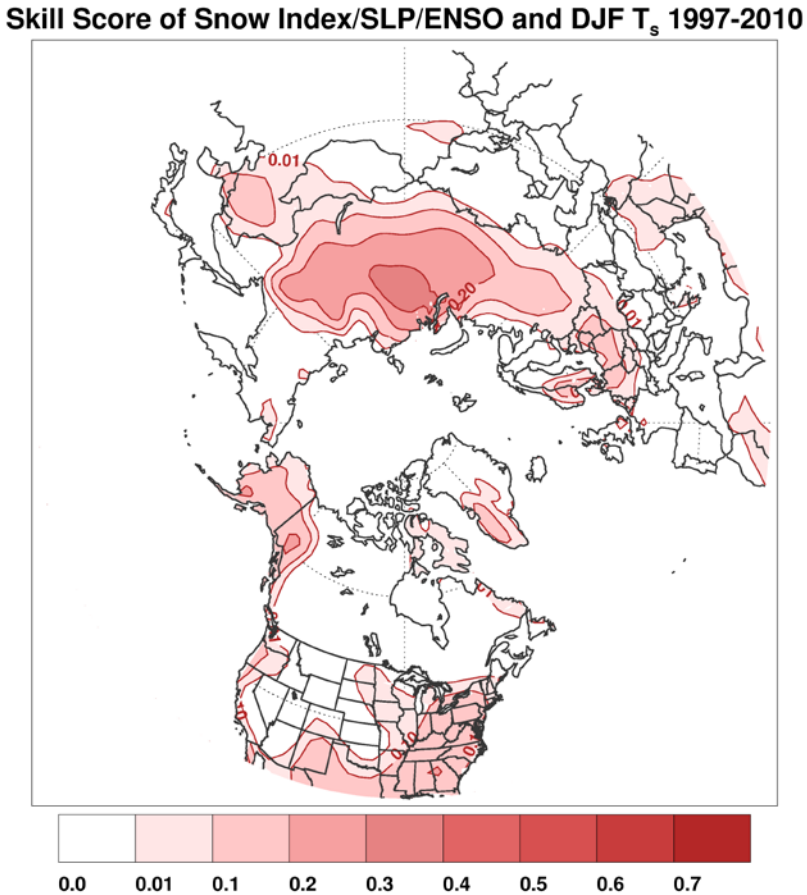


Comparison with Dynamical Models



Cohen and Fletcher (2007)

Skill score of cross validated hindcasts with a simple statistical model



$$SS = \frac{MSE_{\text{climatology}} - MSE_{\text{forecast}}}{MSE_{\text{climatology}}}$$

Summary

- Many previous studies have established that October snow cover extent is significantly correlated with the winter Arctic Oscillation.
- An index of the rate of change of daily snow cover extent in October is more strongly correlated with the winter Arctic Oscillation.
- The SAI shows great potential in improving winter temperature forecasts for many regions that are not well correlated with ENSO variability including the Eastern US and Europe.