



*500mb Synoptic Precursors for
Severe Cold in the
Midwest/Northeast U.S*

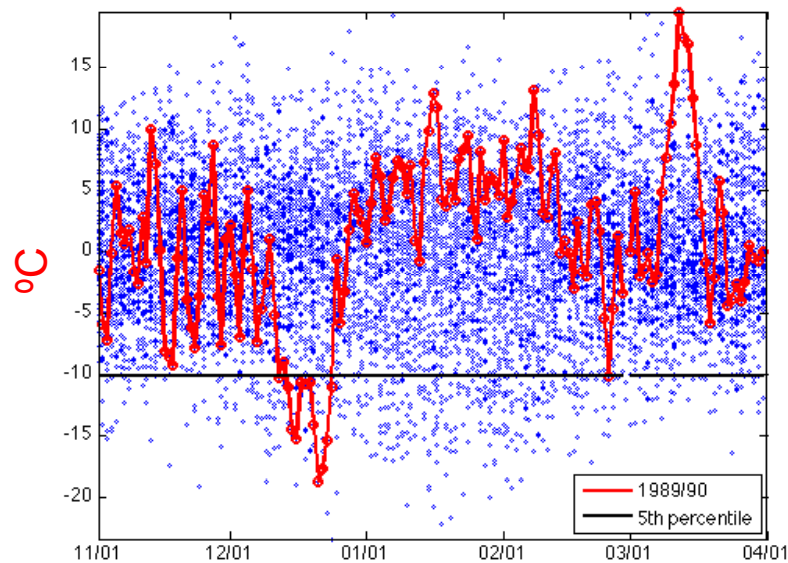
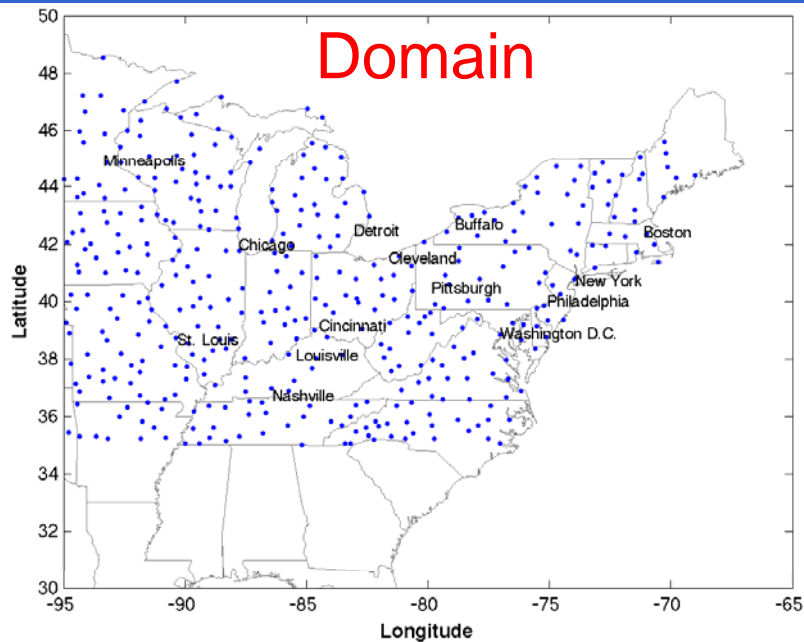
Kristen Guirguis
Alexander Gershunov
Stephen Bennett
Scripps Institution of Oceanography

Background

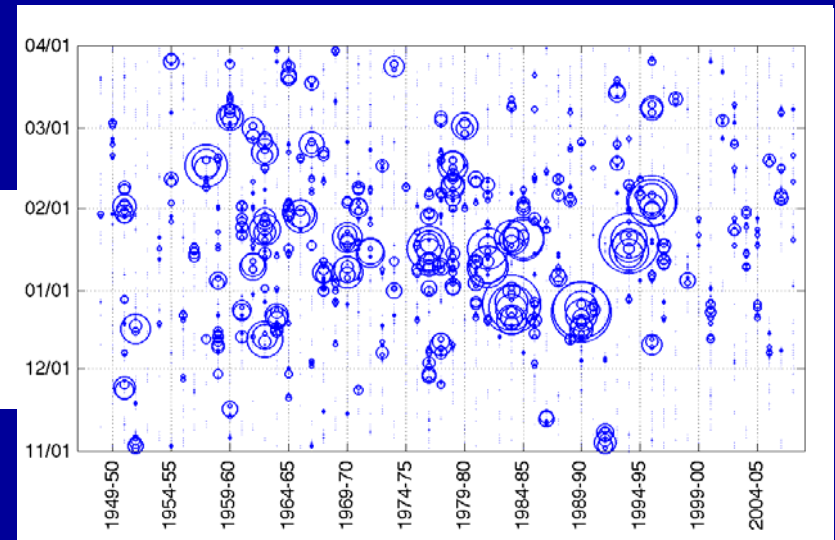
- Identify relationships between precursor weather patterns and severe cold outbreaks
- Quantify relationships in probabilistic framework
- Tool that can be used along side model forecasts for making decisions related to energy demand

Severe Cold Index

- Historical station data: 1948-2008
- Winter season (Nov-Mar)
- Seasonal cycle removed
- Local index = threshold exceedences (magnitude below 5th percentile)
- Regional index



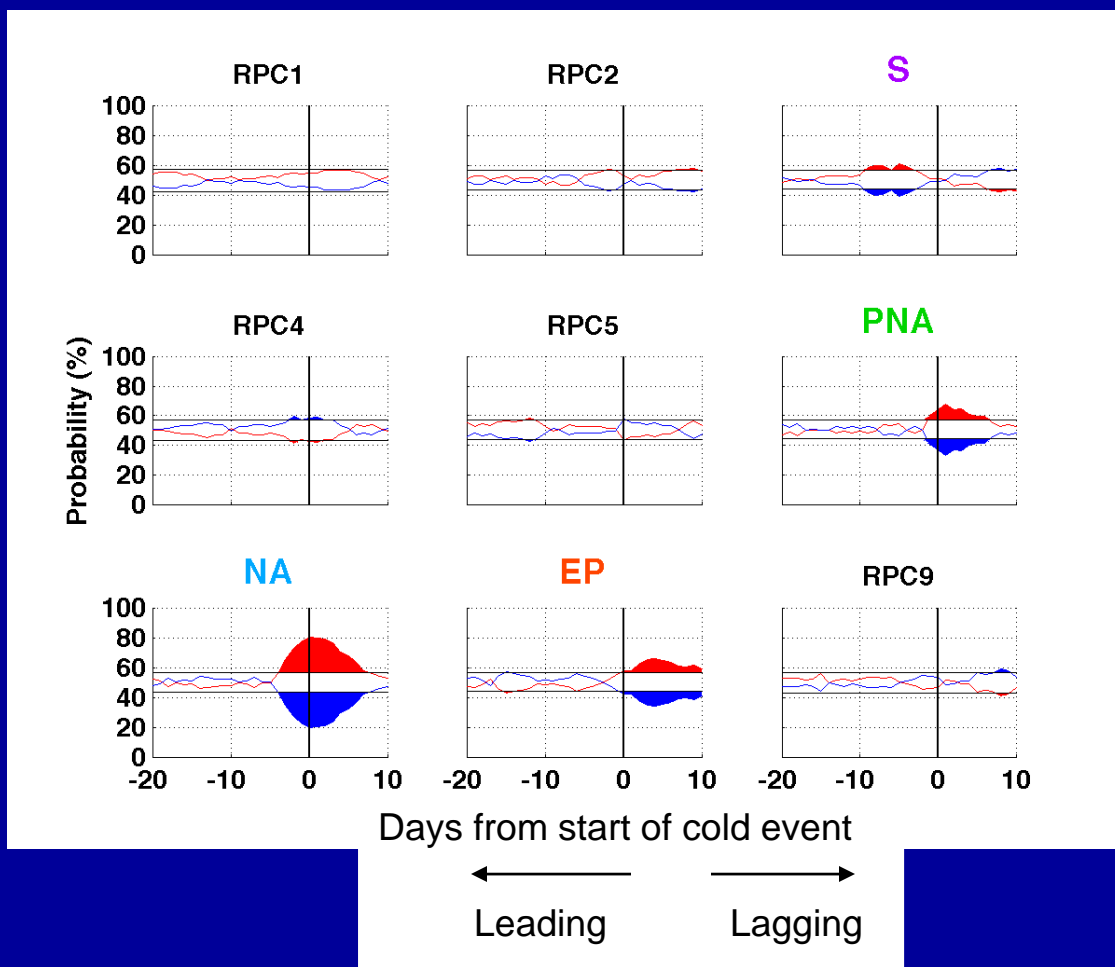
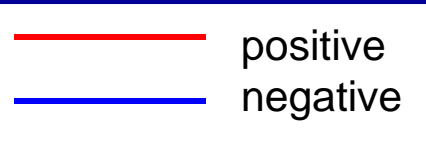
Month/day



Month/day

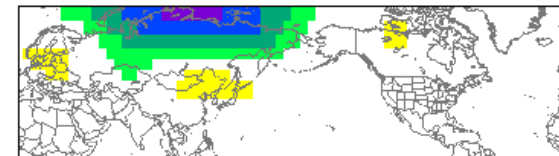
Year

Circulation Anomaly Patterns and probabilistic relationship to severe cold

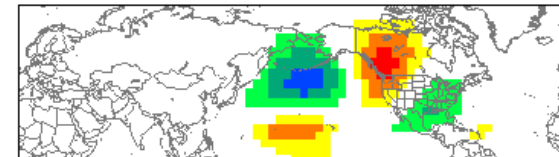


500 mb Height
Rotated Empirical Orthogonal
Functions

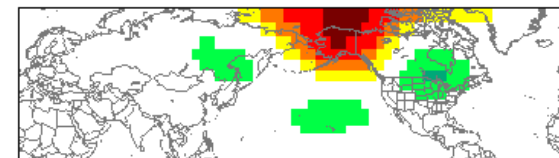
Siberia (S)



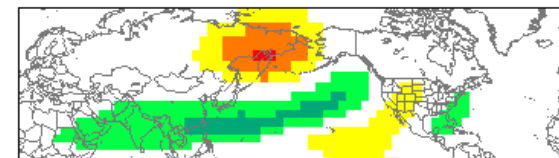
Pacific North Atlantic (PNA)



North America (NA)

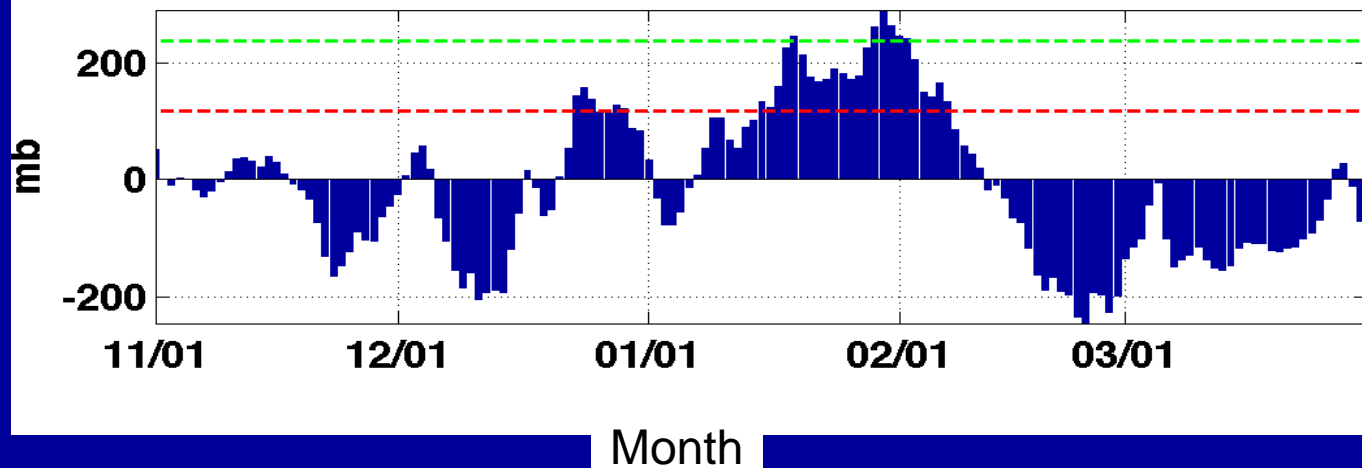


Eurasia-Pacific (EP)

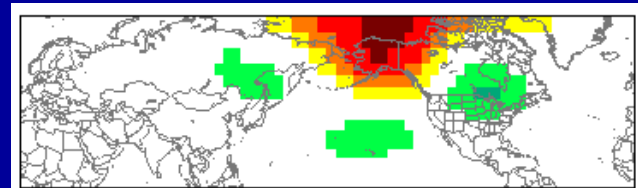


Identify Synoptic Events

Magnitude of Circulation Anomaly

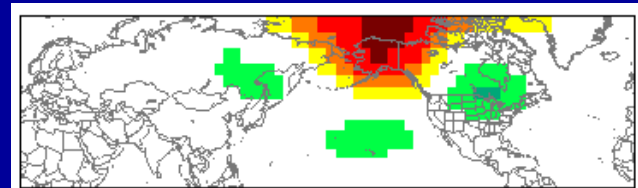
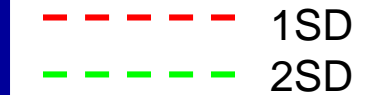
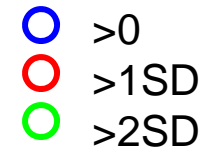
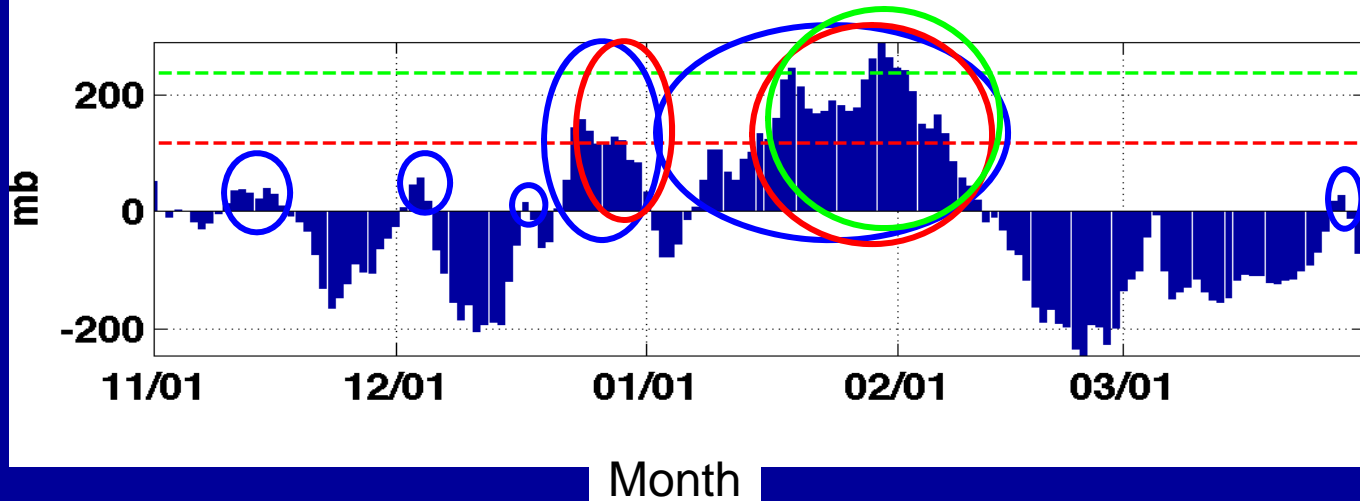


--- 1SD
--- 2SD

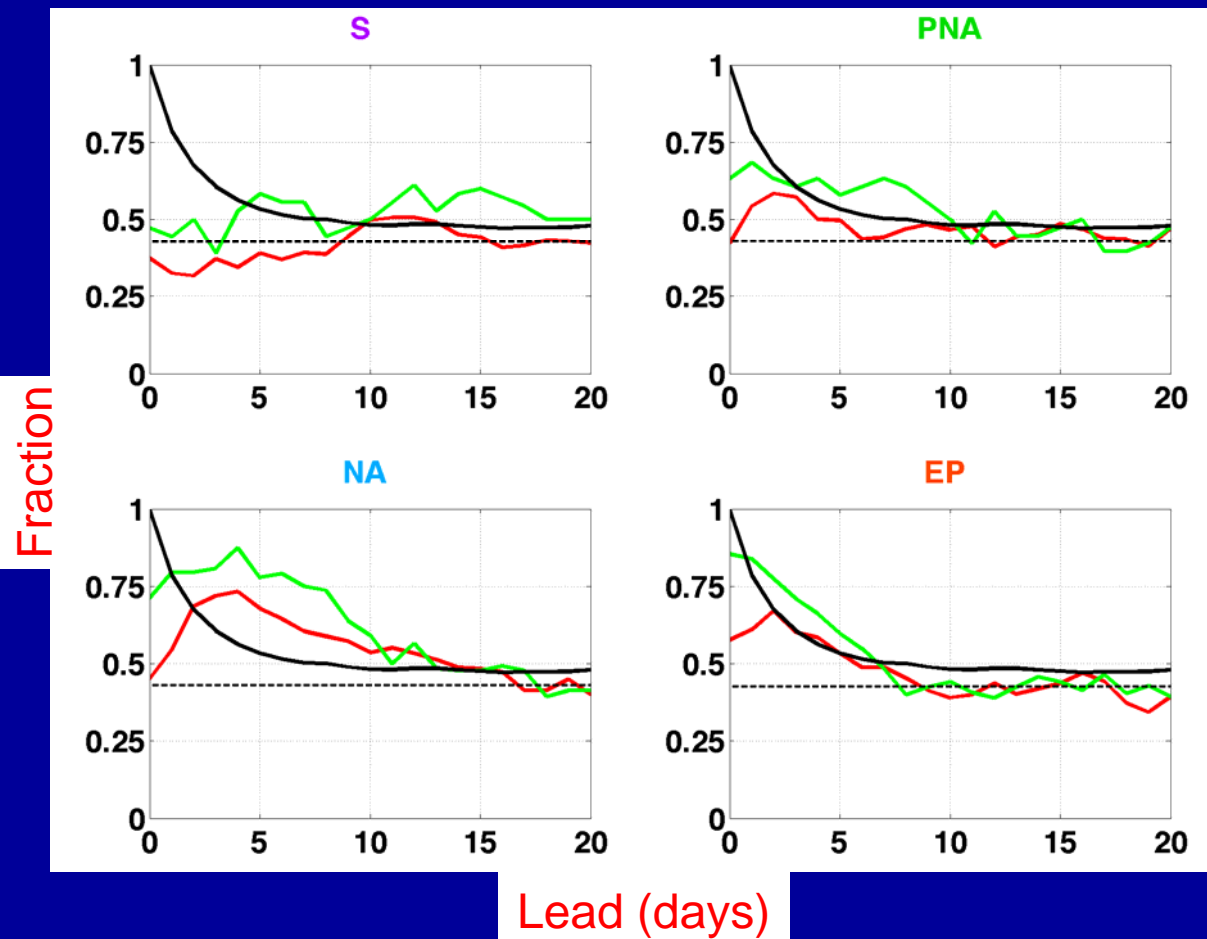
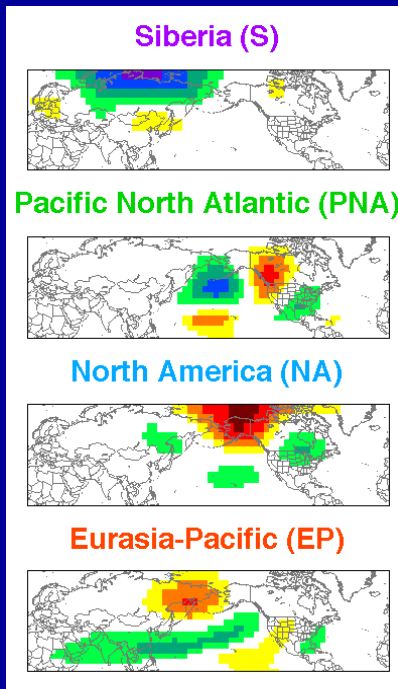
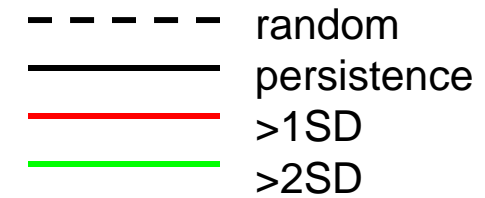


Identify Synoptic Events

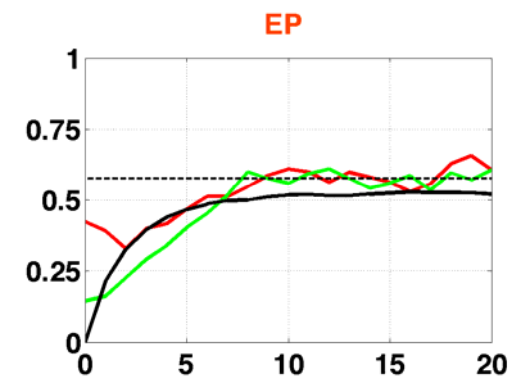
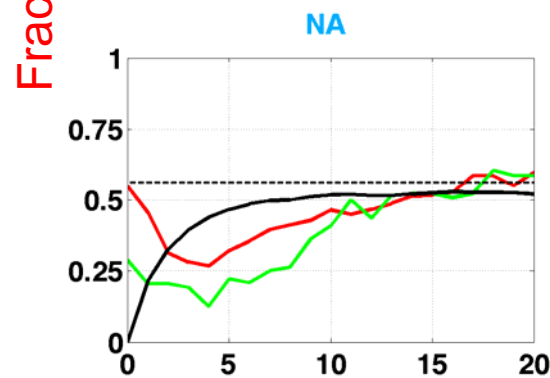
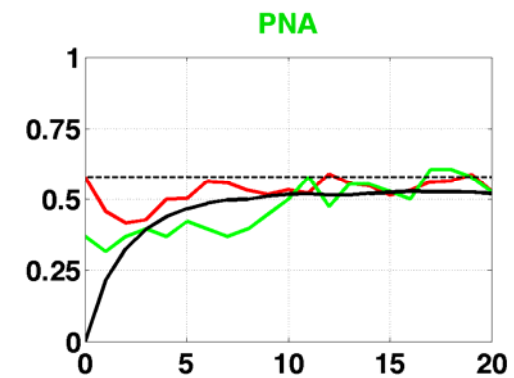
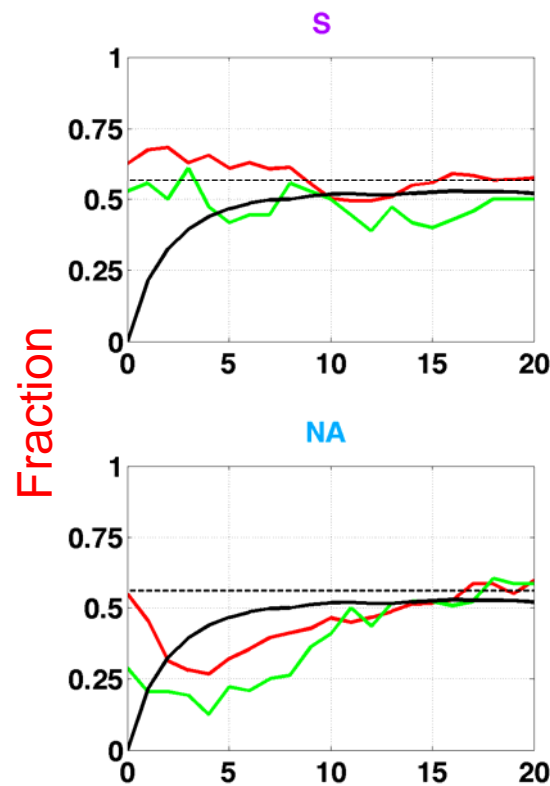
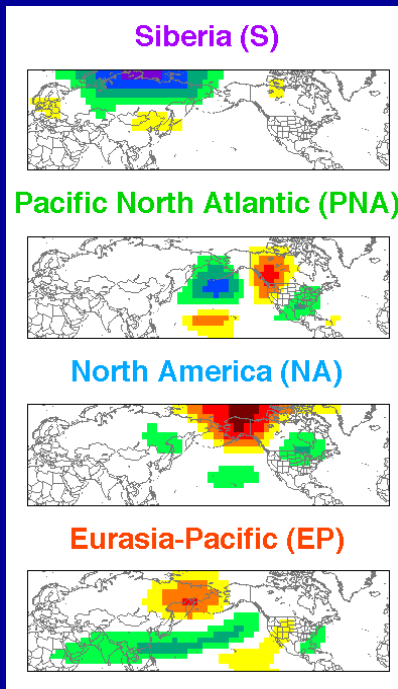
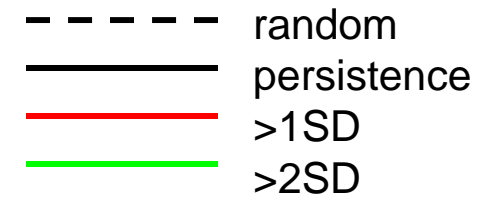
Magnitude of Circulation Anomaly



Correct Forecasts (Hits)



False Alarms



Lead (days)

Conclusions

- Systematic approach to quantifying relationships between synoptic precursors and extreme weather
 - Can be easily applied to other domains and atmospheric variables
 - Predictive skill exceeds persistence
 - Used to extend lead time if predictive signals are seen in observations or model forecasts

- Future Work
 - Predictive capability of combined circulation anomaly patterns, and lag/lead relationships
 - probabilistic model for forecasting temperature extremes