Posted at: http://pielkeclimatesci.wordpress.com/2012/05/08/marcia-wyatts-university-of-colorado-at-boulder-ph-d-dissertation-a-multidecadal-climate-signal-propagating-across-the-northern-hemisphere/

by rpielke | May 8, 2012 · 1:08 pm

Marcia Wyatt's University of Colorado at Boulder Ph.d Dissertation "A Multidecadal Climate Signal Propagating Across the Northern Hemisphere"

I was pleased to serve as co-advisor with Peter Molnar on the successful Ph.d defense in the Department of Geological Sciences at the University of Colorado in Boulder yesterday of Marcia Wyatt . Other members of her committee were Thomas Marchitto, Balaji Rajagopalan, Anastasios Tsonis, Sergev Kravstov and Judy Curry. The dissertation has gone through review by the committee who have approved it.

I have presented the three parts of her dissertation below [presented with Marcia's approval]. The first paper has already been published and the other two will be submitted soon [highlight added].

Paper #1:

Marcia Glaze Wyatt, Sergey Kravtsov,and Anastasios A. Tsonis, 2011: Atlantic Multidecadal Oscillation and Northern Hemisphere's climate variability. Climate Dynamics Published online April 12, 2011 Clim Dyn DOI 10.1007/s00382-011-1071-8

Proxy and instrumental records reflect a quasi-cyclic 50-to-80-year climate signal across the Northern Hemisphere, with particular presence in theNorth Atlantic. Modeling studies rationalize this variability in terms of intrinsic dynamics of the Atlantic Meridional Overturning Circulation influencing distribution of sea-surface-temperature anomalies in the Atlantic Ocean; hence the name Atlantic Multidecadal

Oscillation (AMO). **By analyzing a lagged covariance structure of a network of climate indices, this study details the AMO-signal propagation throughout the Northern Hemisphere via a sequence of atmospheric and lagged oceanic teleconnections, which the authors term the "stadium wave".** Initial changes in the North Atlantic temperature anomaly associated with AMO culminate in an oppositely signed hemispheric signal about 30 years later. Furthermore, shorter-term, interannual-to-interdecadal climate variability alters character according to polarity of the stadium-wave-induced prevailing hemispheric climate regime. **Ongoing research suggests mutual interaction between shorter-term variability and the stadium wave, with indication of ensuing modifications of multidecadal variability within the Atlantic sector**.

Results presented here support the hypothesis that AMO plays a significant role in hemispheric and, by inference, global climate variability, with implications for climate-change attribution and prediction.

Paper #2:

Northern Hemisphere Multidecadal Climate Variability: dynamics and history of climate-signal hemispheric propagation: 1700 to 2000 [to be submitted]

Marcia Glaze Wyatt

Instrumental and proxy records of diverse climate indices across the Northern Hemisphere share a multidecadal-scale tempo of variability. Previous analysis suggests the observed temporal commonality is rooted in synchronization of a hemispheric network of atmospheric and lagged oceanic circulations through which the climate signal propagates. Uncertainties regarding this dynamic's mechanisms and its historical longevity linger. To investigate these, proxy data are analyzed in context of a network of quasi-oscillatory climate indices. Findings suggest i) **the observed 20th century signal-propagation has existed in somewhat similar fashion for the 300-year length of this study**; **ii) Eurasian-Arctic-Shelf sea-ice plays a strong role in the propagation of the hemispheric climate signal; and iii) dynamics fundamental to generation of the multidecadal component of the Northern Hemisphere's surface temperature (NHT) are encoded onto the records of key proxy indices, the combined signatures of which trace the hemispheric circumnavigation of the secularly varying, sequentially propagating climate signal.**

Paper #3:

A Secularly Varying Hemispheric Climate-Signal Propagation Previously Detected in Instrumental and Proxy Data Not Detected in CMIP3 Data Base [to be submitted]

By Marcia Glaze Wyatt, Sergey Kravtsov, John M. Peters, and Anastasios A. Tsonis

Previous study results support existence of a multidecadal, quasi-oscillatory climate signal, propagating through a network of synchronized climate indices across the Northern Hemisphere. In this present model-data-based study, we seek to detect this same signal. Methods used in two preceding studies on climate-signal propagation guide the strategy for this companion study. A network of simulated climate indices, reconstructed from a data set generated by models of the third Coupled Intercomparison Project (CMIP3 (Meehl et al. 2007)), is analyzed. **None of the sixty analyses performed on these networks succeeded in reproducing a propagating signal.** While model results varied from one another in the climate footprints simulated, their results were far more similar to one another than they were to observations found in the instrumental and proxy networks, implying **physical mechanisms relevant to signal propagation may be missing from this suite of general circulation models**.