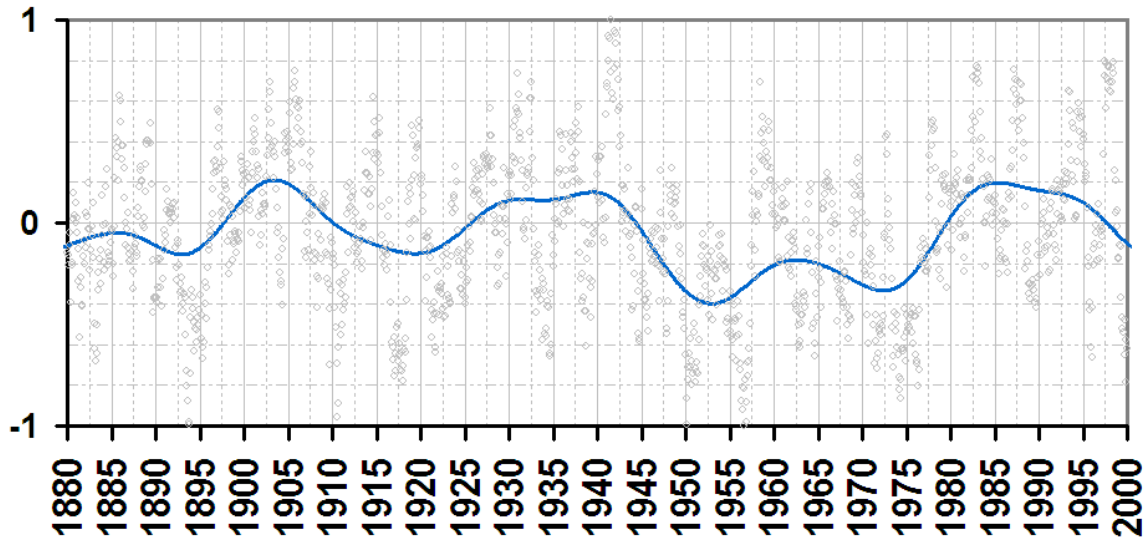


ERSST EOF 1234

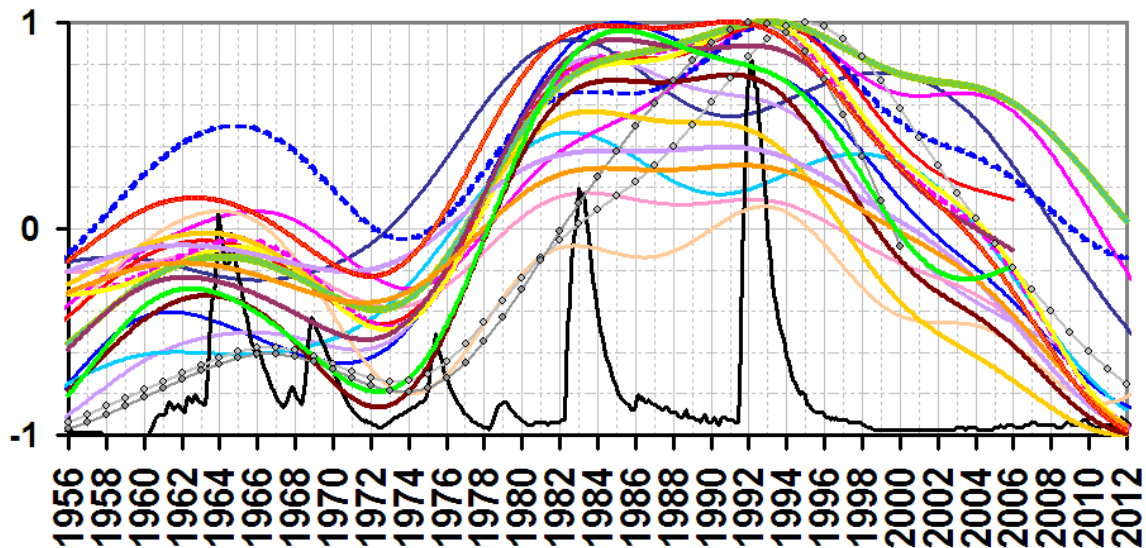
Paul Vaughan, M.Sc. – May 24, 2014

EOFs (empirical orthogonal functions) 1-4 of ERSSTv3b2 (Extended Reconstructed Sea Surface Temperature) unambiguously underscore solar & lunisolar governance of climate.

EOF2 is basically the IPO (Interdecadal Pacific Oscillation):

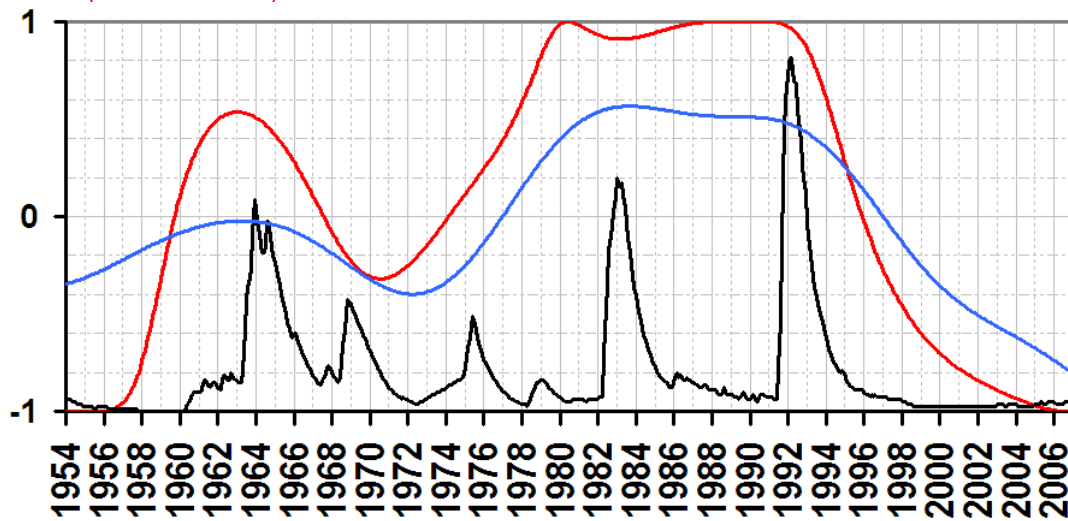


Over the interval for which we have good QBO (QuasiBiennial Oscillation) & EOP (Earth Orientation Parameter) records, the envelope of SAOT (stratospheric aerosol optical thickness) is coherent with an empirical ensemble of IPO indices based on SST (sea surface temperature) & SLP (sea level pressure) fields.

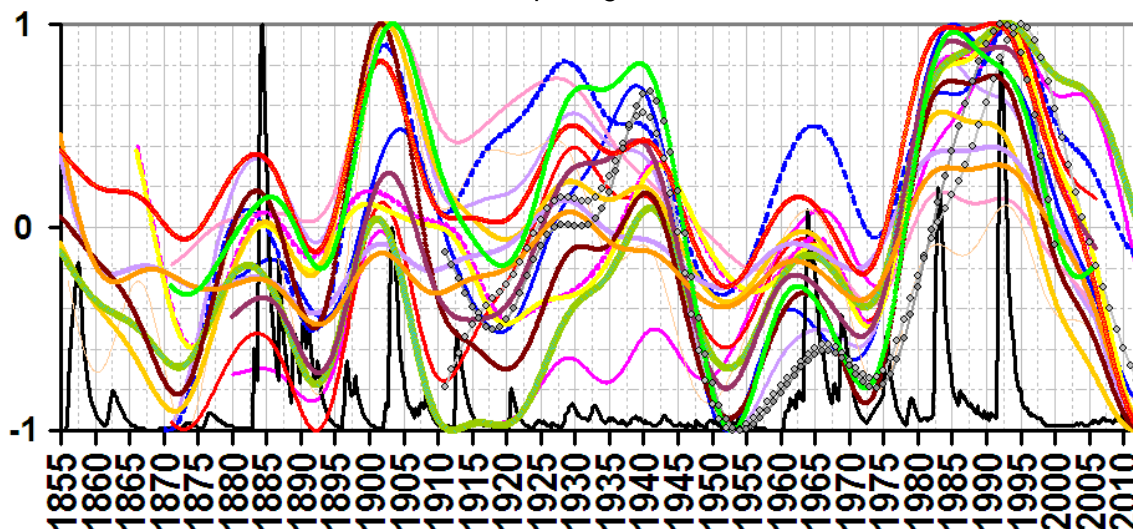


At the timescale of half the Chandler wobble frequency (where there's scaled-resolved phase coherence), IPO's coherent with the phase (θ) difference between ENSO (El Nino / Southern Oscillation, indicated here by MEI = Multivariate ENSO Index) & QBO:

red: $\text{Sin}(\theta_{\text{MEI}} - \theta_{\text{QBO}})$ blue: interdecadal ERSSTv3b2 EOF2 black: SAOT



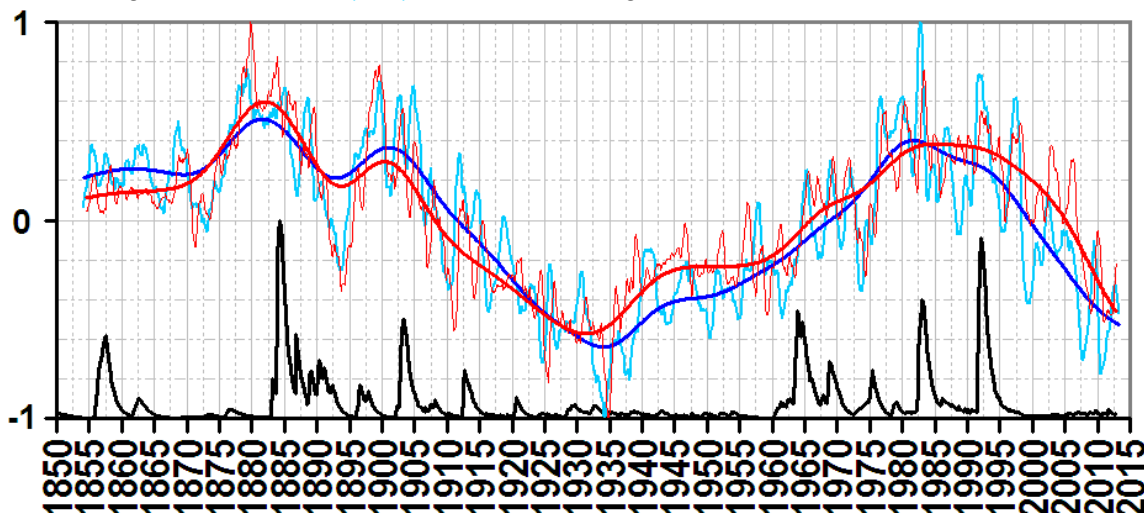
IPO coherence with SAOT towers is compelling across the entire multivariate record.



The WWI-WWII pattern invites further exploration and demands deeper understanding.

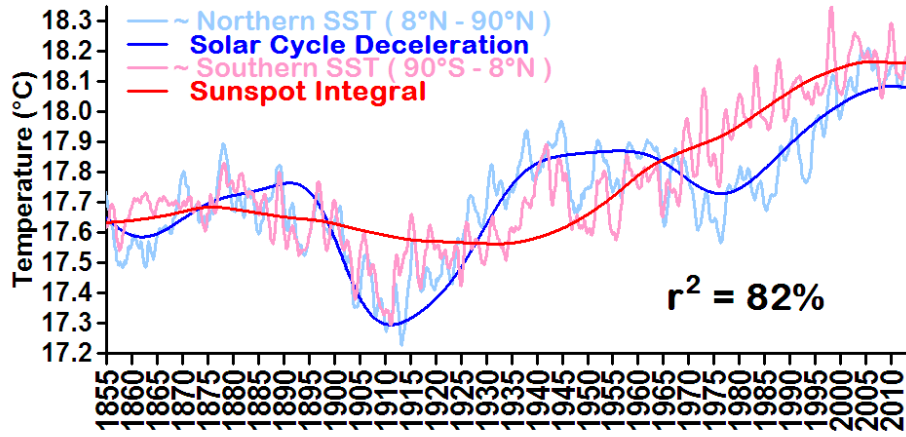
A major clue comes from EOF3, which loads heavily on the Southern Ocean (SO) & SouthEast Pacific (SEP) and more generally on an interhemispheric contrast (see appendix).

Combining EOF2 & EOF3 (blue) resolves the longer-term coherence structure.



This underscores *tight coupling* (including the well-known Humboldt Current) of ENSO variance & SO/SEP mean. (Red immediately above is Southern Ocean (60°S - 90°S) ERSSTv3b2.)

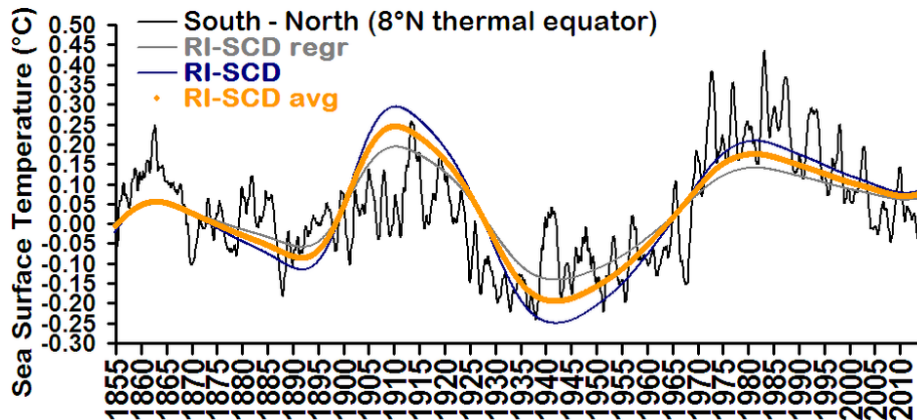
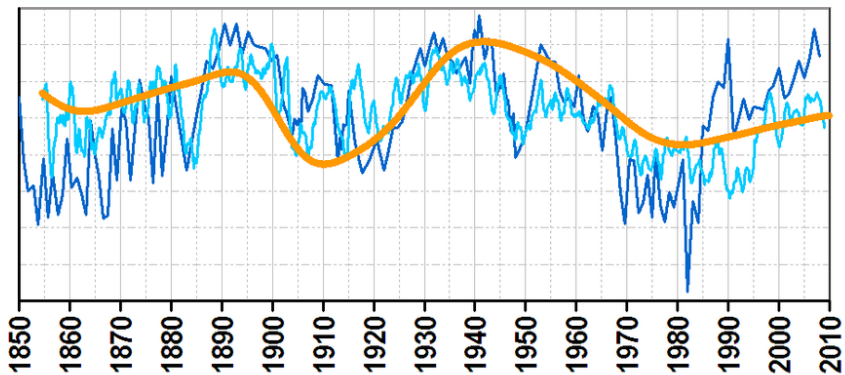
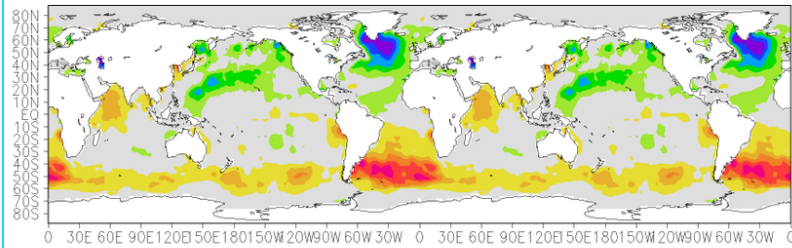
EOF4 indicates the other North-South contrast:



Solar Cycle Deceleration - Sunspot Integral

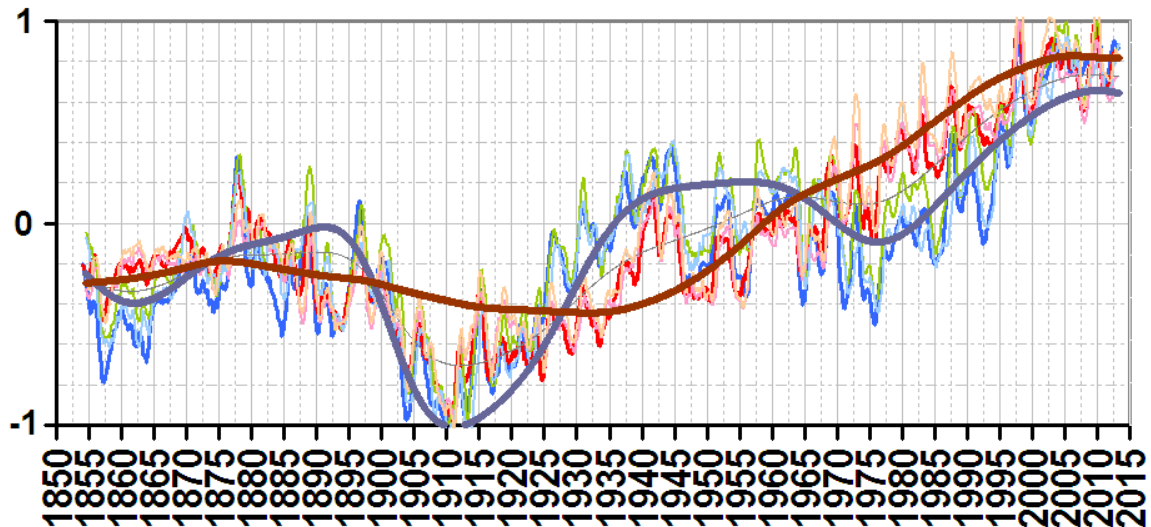
Globigerina bulloides abundance (Black+ (1999))

Interhemispheric Sea Surface Temperature (SST) Gradient based on *Gb* correlation pattern = index of Atlantic Meridional Overturning Circulation



Caution: AMOC (Atlantic Meridional Overturning Circulation) & IPO differ fundamentally. Both of the following need careful reinterpretation &/or revision: (a) Wyatt & Curry's "stadium wave" concept (which conflates signals of fundamentally differing origin) and (b) Mann's apparent attempt to redefine AMO (Atlantic Multidecadal Oscillation) as IPO (which would realign Atlantic modeling with Meehl, Trenberth, et al. (2013) & England et al. (2014)). [related comments: (a) & (b)]

Trivial linear recombination of EOFs 1, 3, & 4 (retaining the relative weights indicated in the appendix) provides further interpretation-easing illumination.

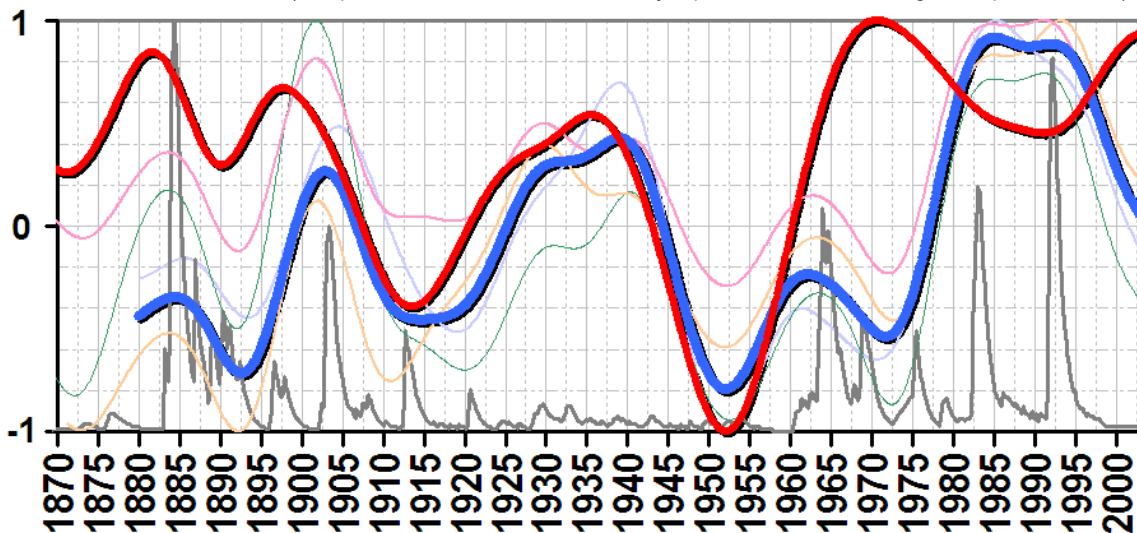


It can be [proven geometrically](#) that this pattern is governed by the sun. (The proof is based on the laws of large numbers and conservation of angular momentum.)

The IPO appears to be of lunisolar origin. Mainstream climate scientists are advised to seek assistance from EOP experts (e.g. at NASA JPL) to prove this geometrically. At interdecadal timescale, accurate IPO forecasting appears feasible.

A question that should be visibly answered by NASA JPL EOP experts:

Why did polar motion amplitude (negative in red) reverse the phase of it's coupling with IPO (blue) exactly when modern records (with orders of magnitude lower measurement error) commenced in 1962? (Interpretive note: Measurement error jumps another order of magnitude prior to 1900.)



Selected Links (to stimulate more nuanced attention to fundamental differences between internal (including IPO) & external (including AMO) climate variability):

Dai, A. (2013). [The influence of the inter-decadal Pacific oscillation on US precipitation during 1923-2010](#). Climate Dynamics 41, 633-646.
<http://www.cgd.ucar.edu/cas/adai/papers/Dai-IPO-US-P-ClimDyn2012.pdf>

Concise SPCZ (South Pacific Convergence Zone) Primer:
<http://www.niwa.co.nz/climate/icu/island-climate-update-67-april-2006/feature-article>
 • new (January 2014) SPCZ time series: <http://adsabs.harvard.edu/abs/2014ClDy..tmp...10S>

Extended MEI: http://www.esrl.noaa.gov/psd/enso/mei_ext/table_ext.html
 • (MEI homepage: <http://www.esrl.noaa.gov/psd/enso/mei/mei.html>)

Mohino, E.; Janicot, S.; & Bader, J. (2011). Sahel rainfall and decadal to multi-decadal sea surface temperature variability. Climate Dynamics 37(3-4), 419-440.
[http://laurent.kergoat.free.fr/fulltext\(3\).pdf](http://laurent.kergoat.free.fr/fulltext(3).pdf)

This document might be reorganized &/or expanded at a later date.

Appendix

ERSSTv3b2 EOFs 1-4, courtesy of [KNMI Climate Explorer](#):

#	eigenvalue	explained variance	cumulative	relative weight	1 / (relative weight)
1	10249.0	33.77%	33.77%	1	1
2	3550.0	11.70%	45.46%	0.346375256	2.887042254
3	1826.8	6.02%	51.48%	0.178241780	5.610356908
4	1340.6	4.42%	55.90%	0.130803005	7.645084291

