



**Europäisches Institut
für Klima und Energie**

www.eike-klima-energie.eu

12th International Conference on Climate and Energy

23.-24. November 2018, NH München East Conference Center

The Climate Clock

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Norwegian University of Science and Technology

My research periods

1975-1995: Cybernetics, Signal theory

1995-2009: Lunar tide => Climate => Ecosystems

2014-2016: Solar variability

2016-2018: Global Climate variability

The Motive of Science



The motive of science is:

- To predict the future**
- To control the future**

But, is the future deterministic?

- If not, we can only explain the past**

-- Francis Bacon (1561-1626)

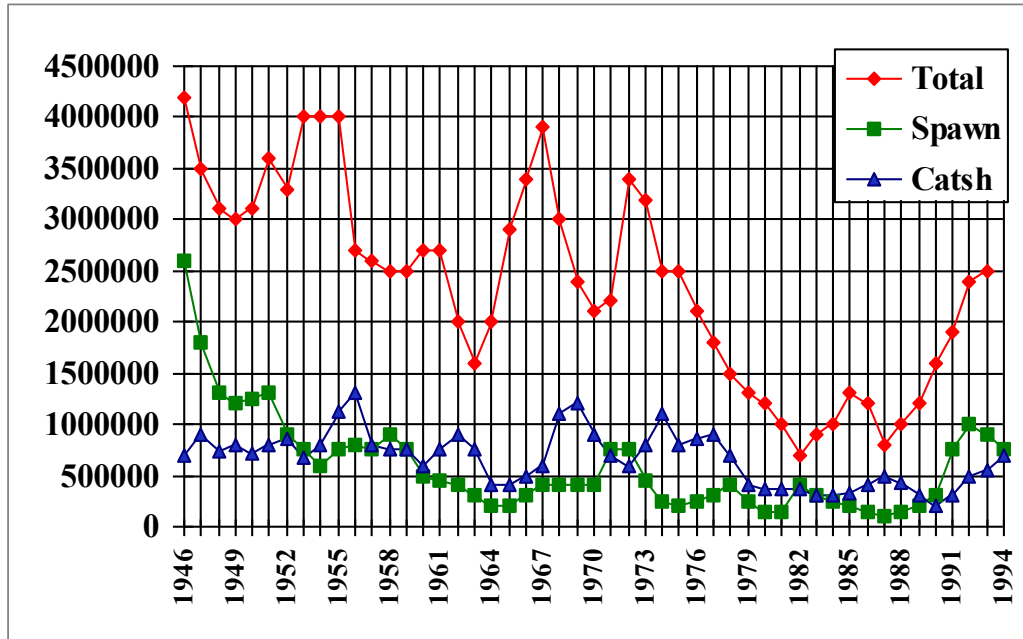
The fishery was growing

Until the fish disappeared, but why?

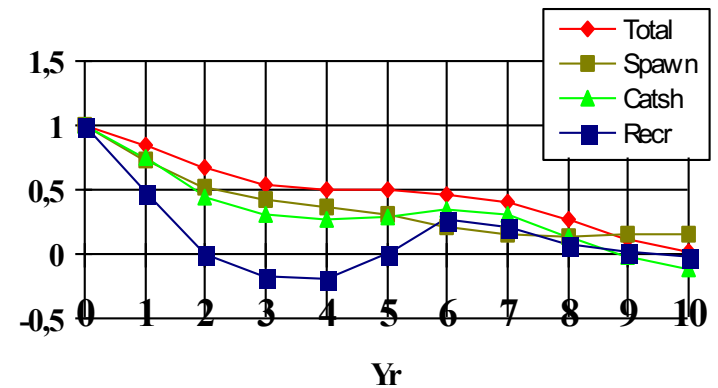


The research question

Cod biomass time series $x(t)$



The autocorrelation



$x(t)=u(t)+v(t)$?
 $u(t)$: stationary cycle
 $v(t)$: random spectrum

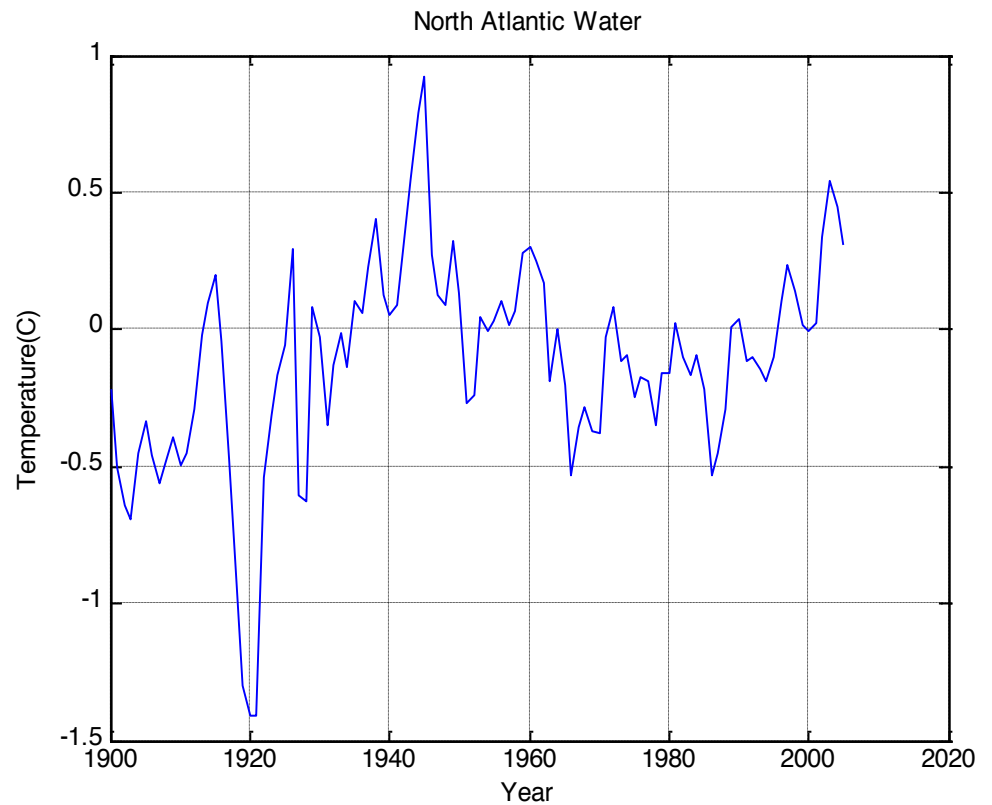
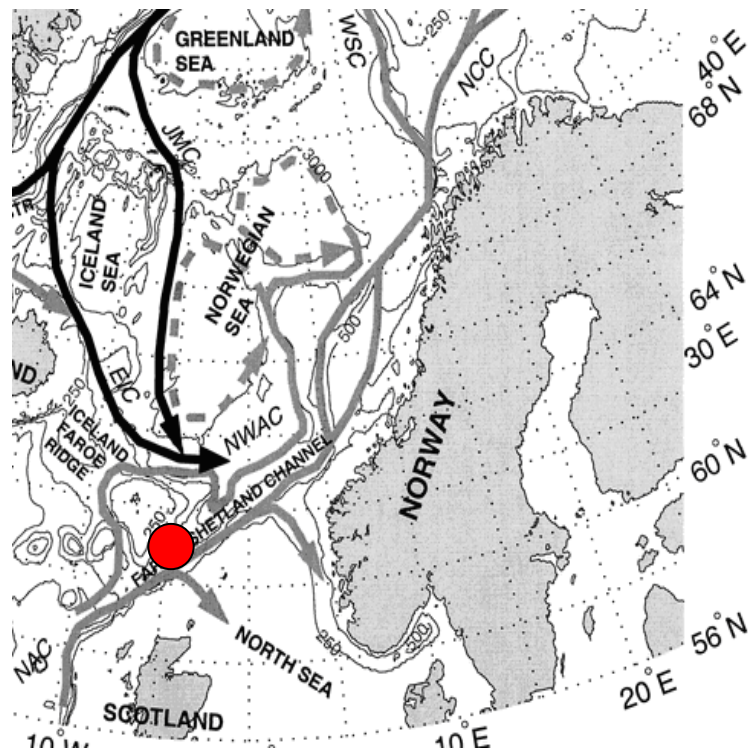
Q: A stationary cycle in the biomass of Northeast Arctic cod?

A: If so, we may predict future biomass fluctuations

If not, limit possibilities of forecasting

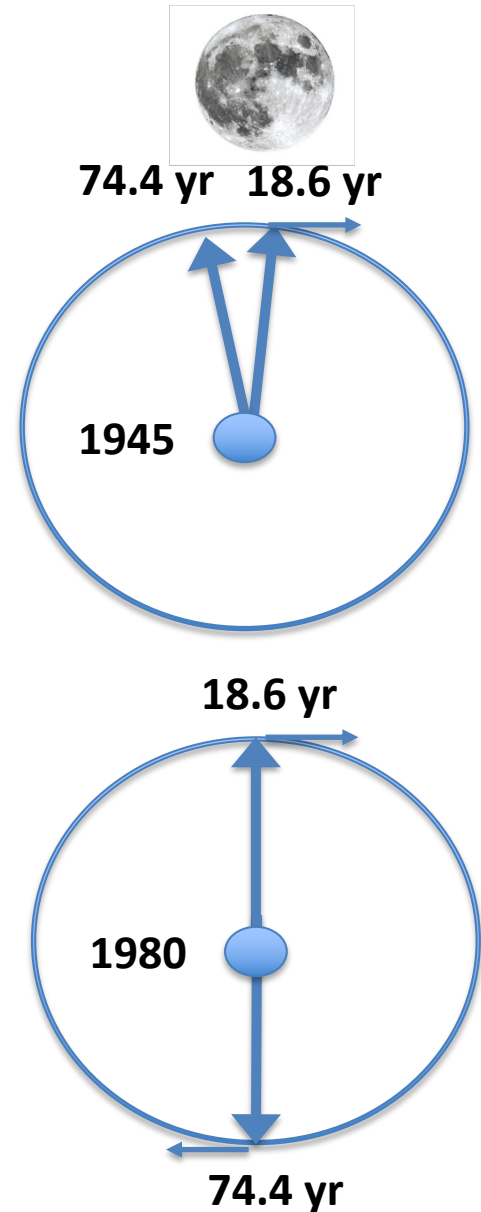
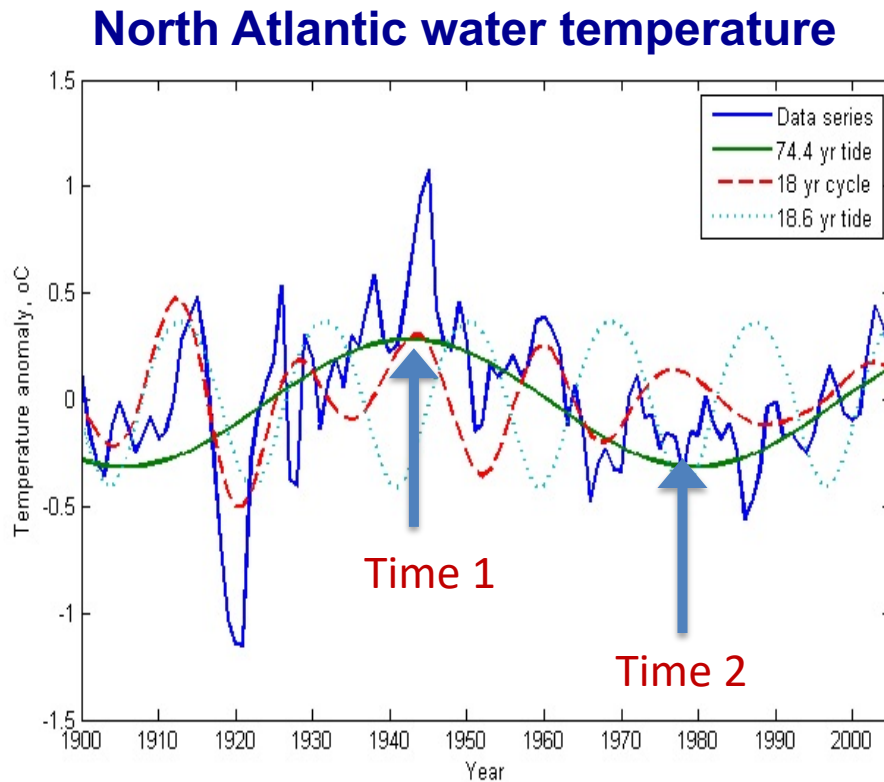
North Atlantic Water temperature

Climate indicator



The Lunar Clock

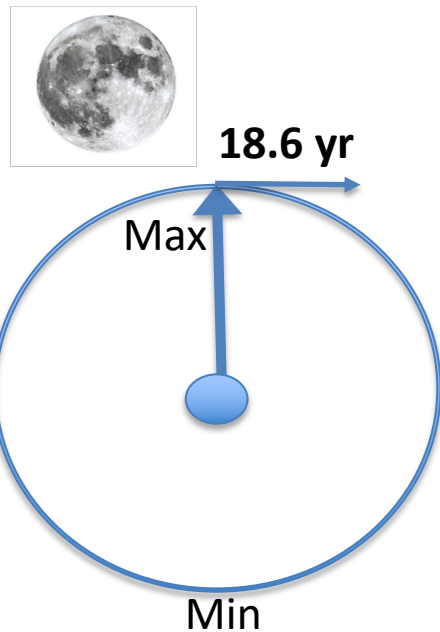
A 18.6-yr period spectrum Controlled by the Moon



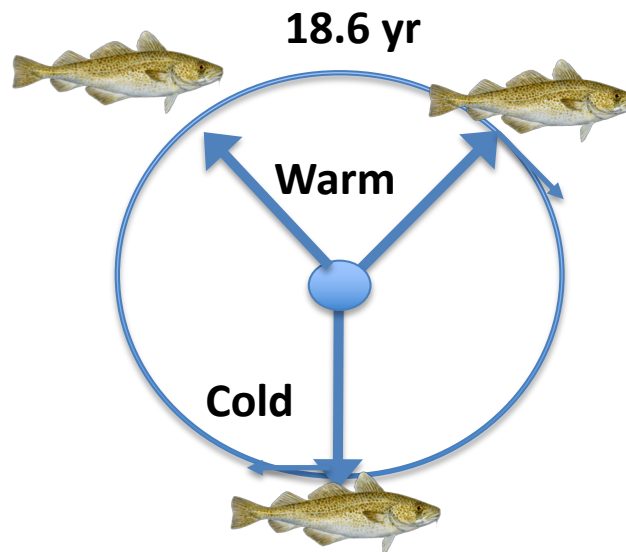
The Lunar Clock

Cod biomass: Period and phase-locked to the 18.6 yr Lunar temperature period

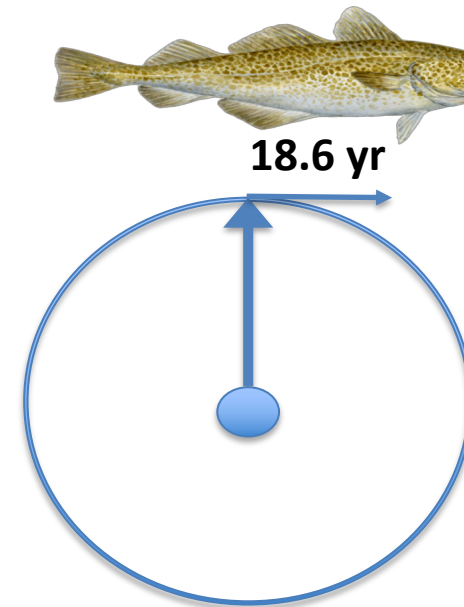
Ocean: Temperature



Cod spawning period
 $18.6/3 = 6.2$ yr



Cod biomass
18.6 yr



+0.5 degree => 20 time
more cod recruitment

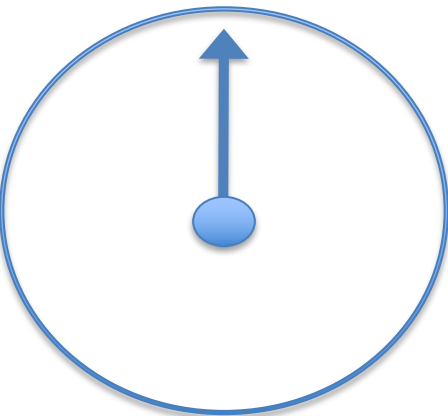
The Lunar Clock

The 18.6-yr lunar period phase-lag

Earth nutation
The Earth axis



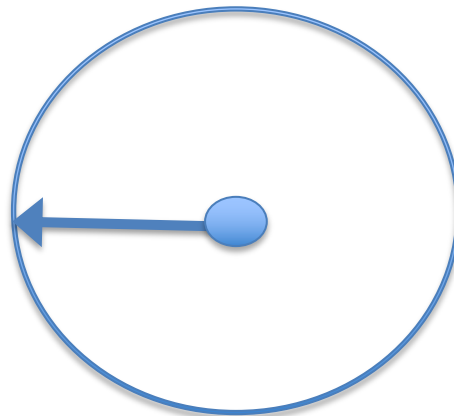
18.6 yr



Lunar nodal tide
Ocean currents



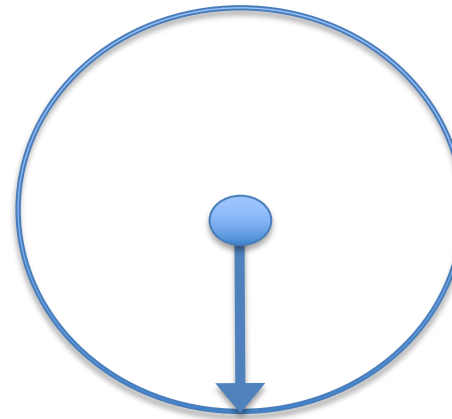
18.6 yr



Lunar periods
Ocean temperature



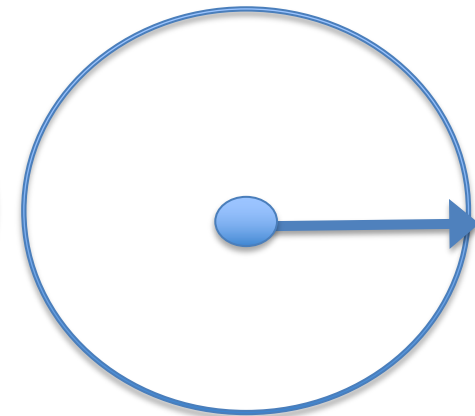
18.6 yr



Lunar periods
NAO-index



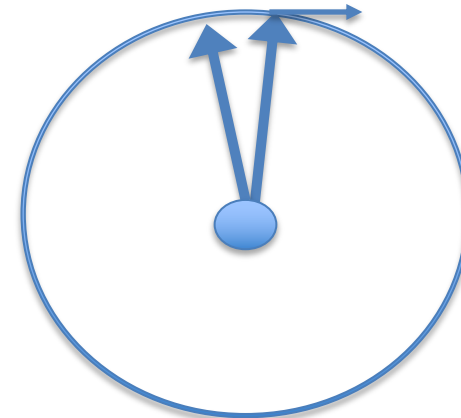
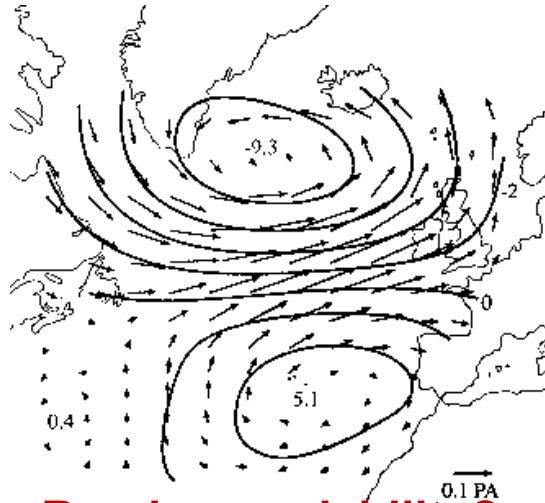
18.6 yr



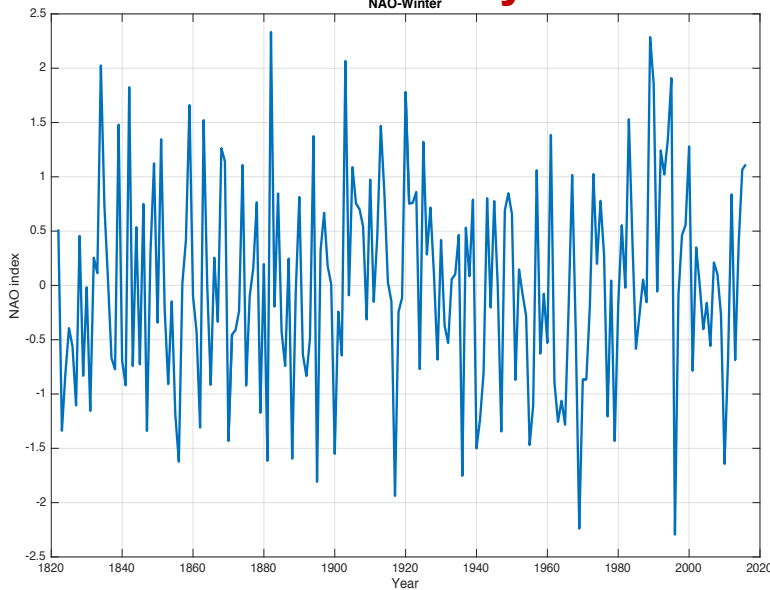
The same cycle period
Different state or phase
The Lunar Clock need a reference

The Lunar Clock

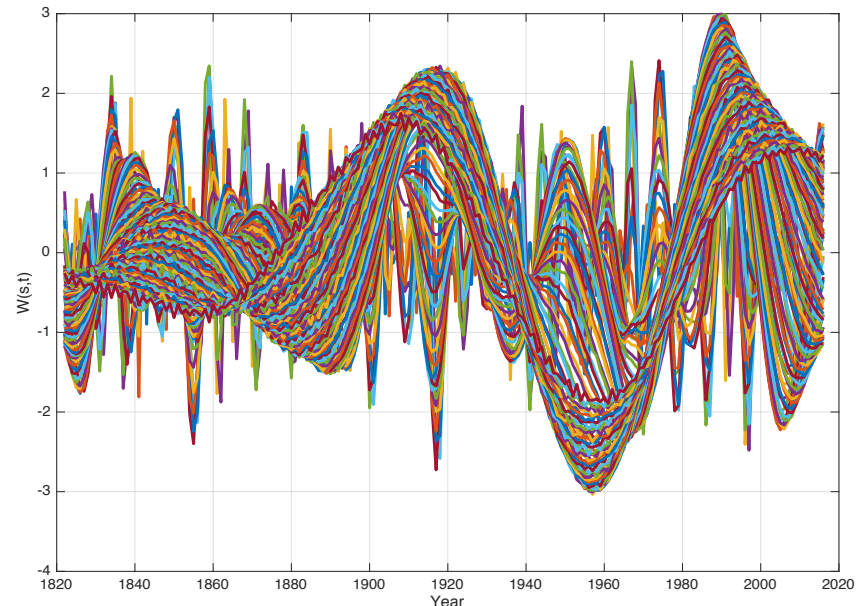
North Atlantic Oscillation (NAO-index) 74.4 yr 18.6 yr



Random variability?

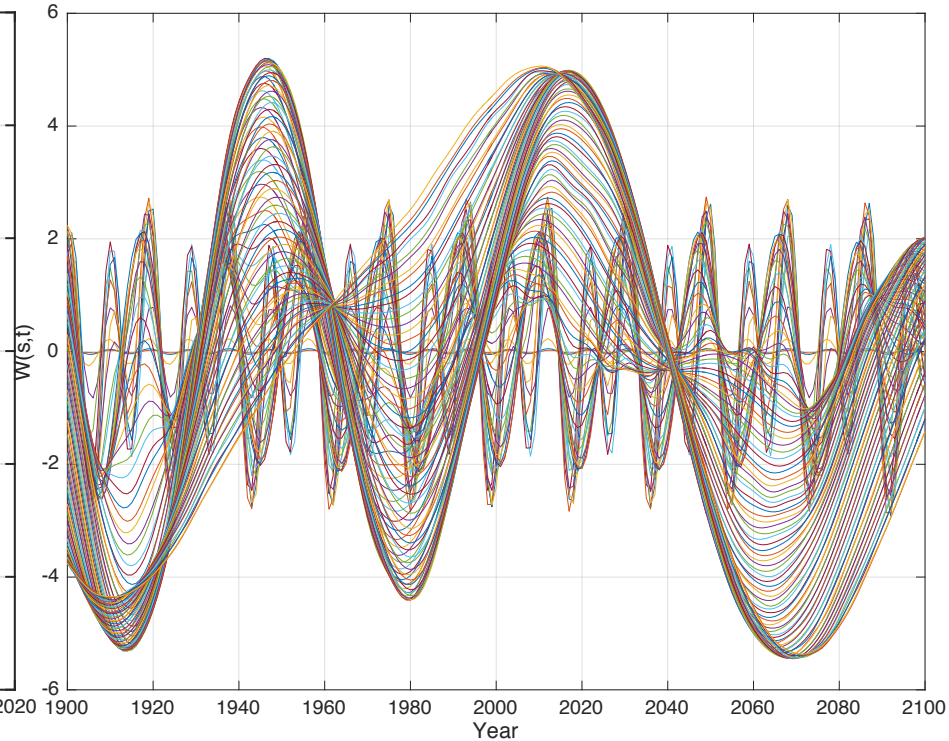
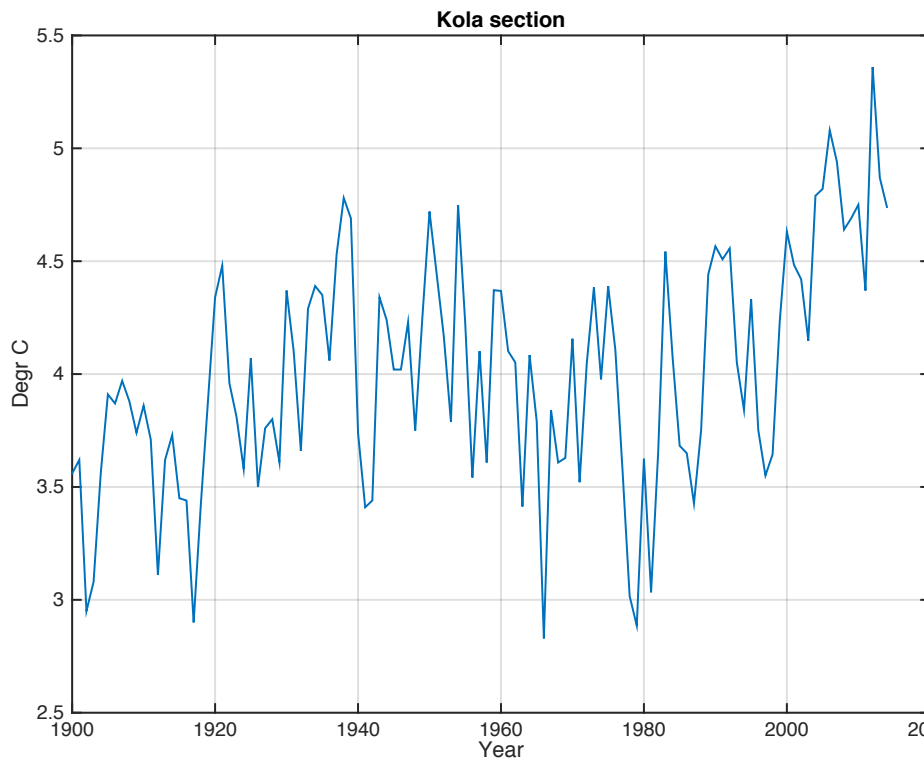


Period- and phase-locked



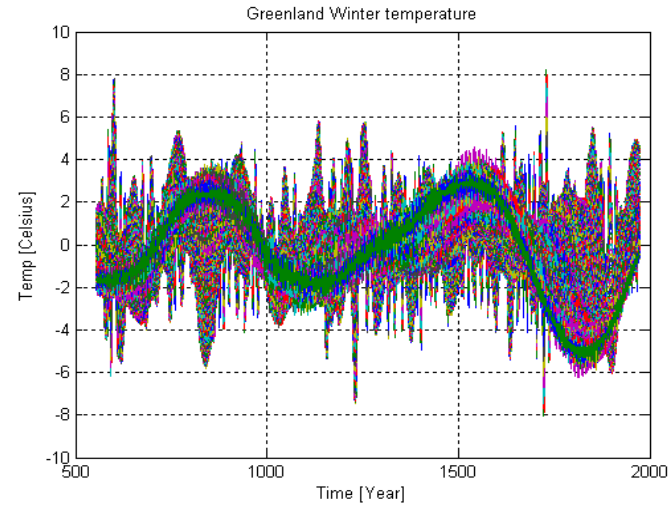
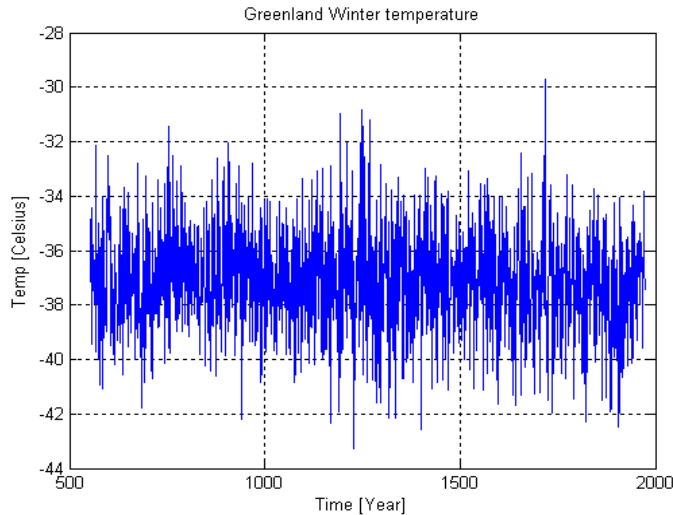
The Lunar Clock, is ticking

and, the Barents Sea temperature is turning

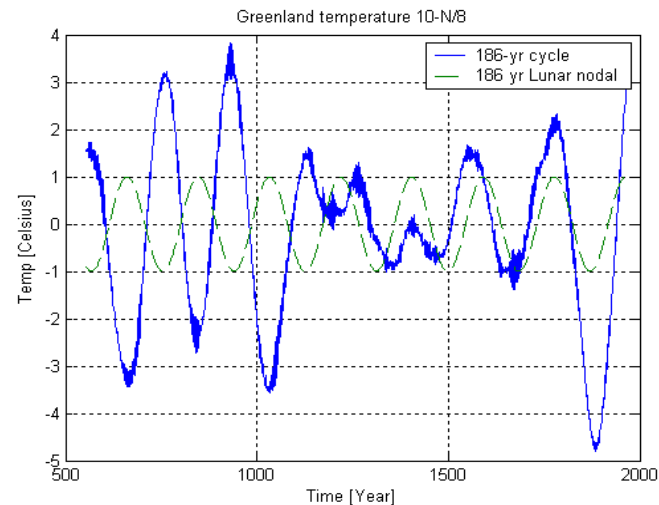


Greenland temperature variability

Wavelet spectrum



Selected nodal cycle of 186 years



Stationary periods:

186-yr period: Next minimum 2040

Deep minimum 2105

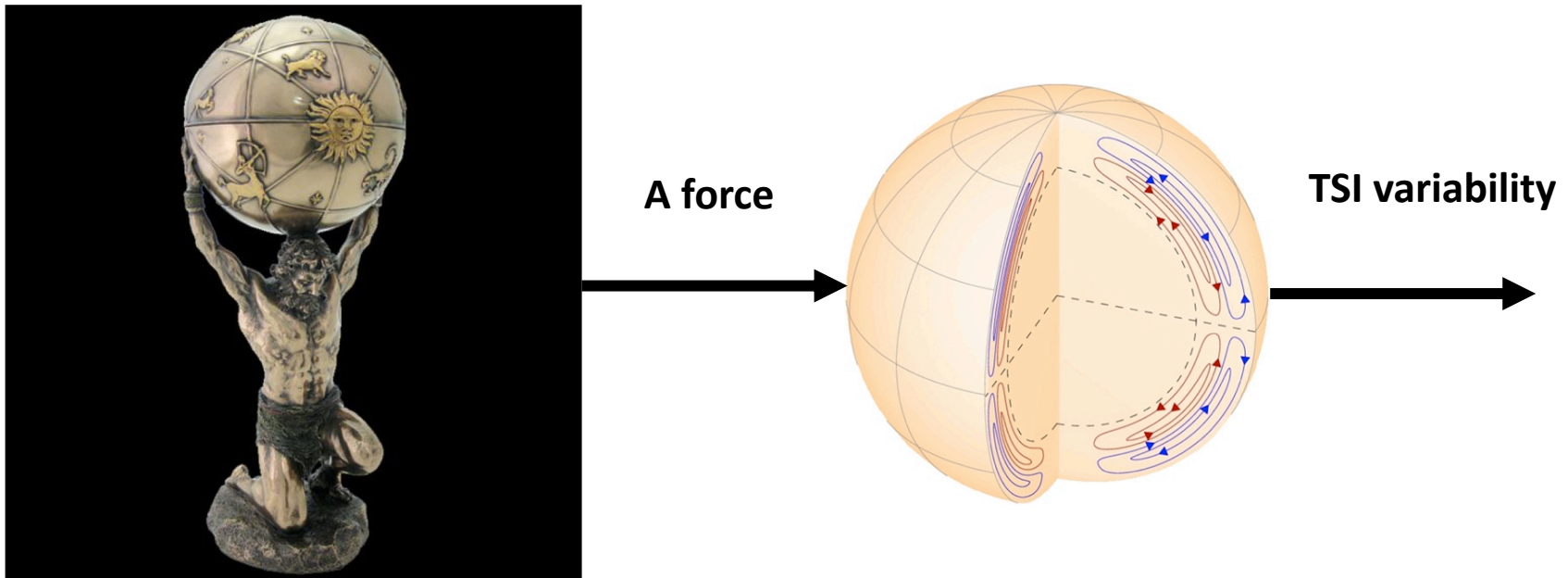
Computes a new deep cold period

The research question

Has Solar irradiation stationary periods?

- If not, we can never predict future solar irradiation
- If so, the periods must have an external stationary force, as the first cause
- And, there will be a next deep minimum solar irradiation

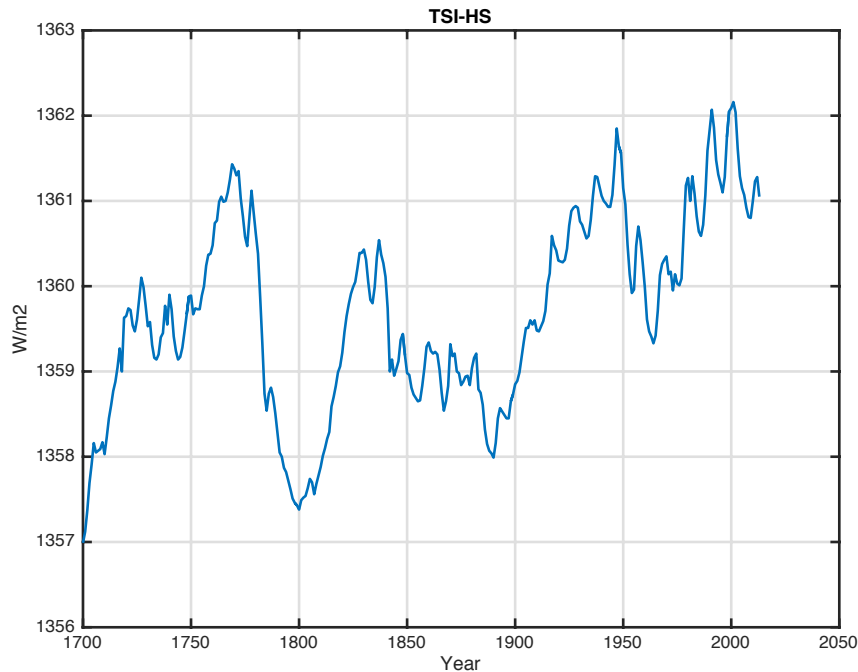
The Cause of causes



Total Solar Irradiation periods

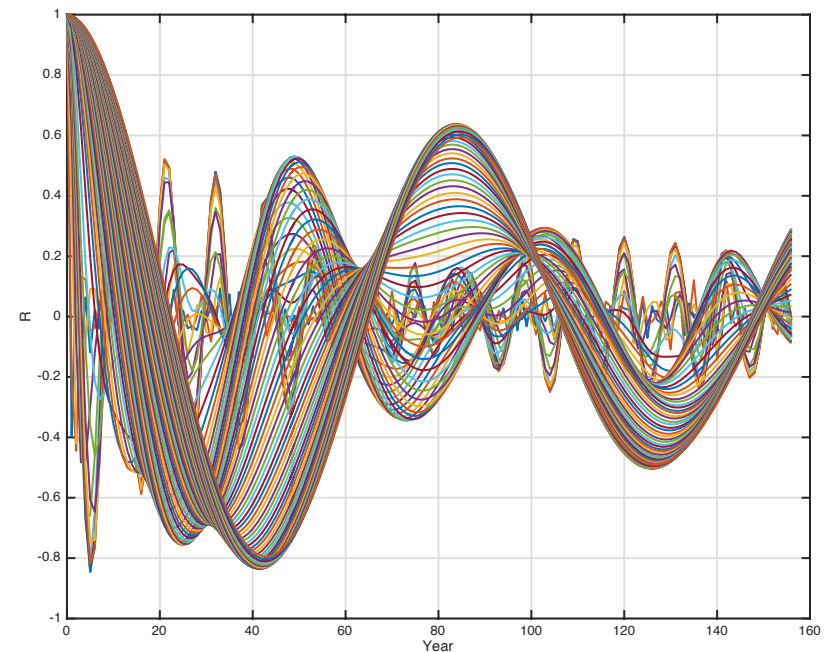
ACRIM TSI (Hoyt-Schatten)

(Scafetta and Willson 2014)



(Yndestad and Solheim, 2017, New Astronomy)

Autocorrelations of the Wavelet spectrum

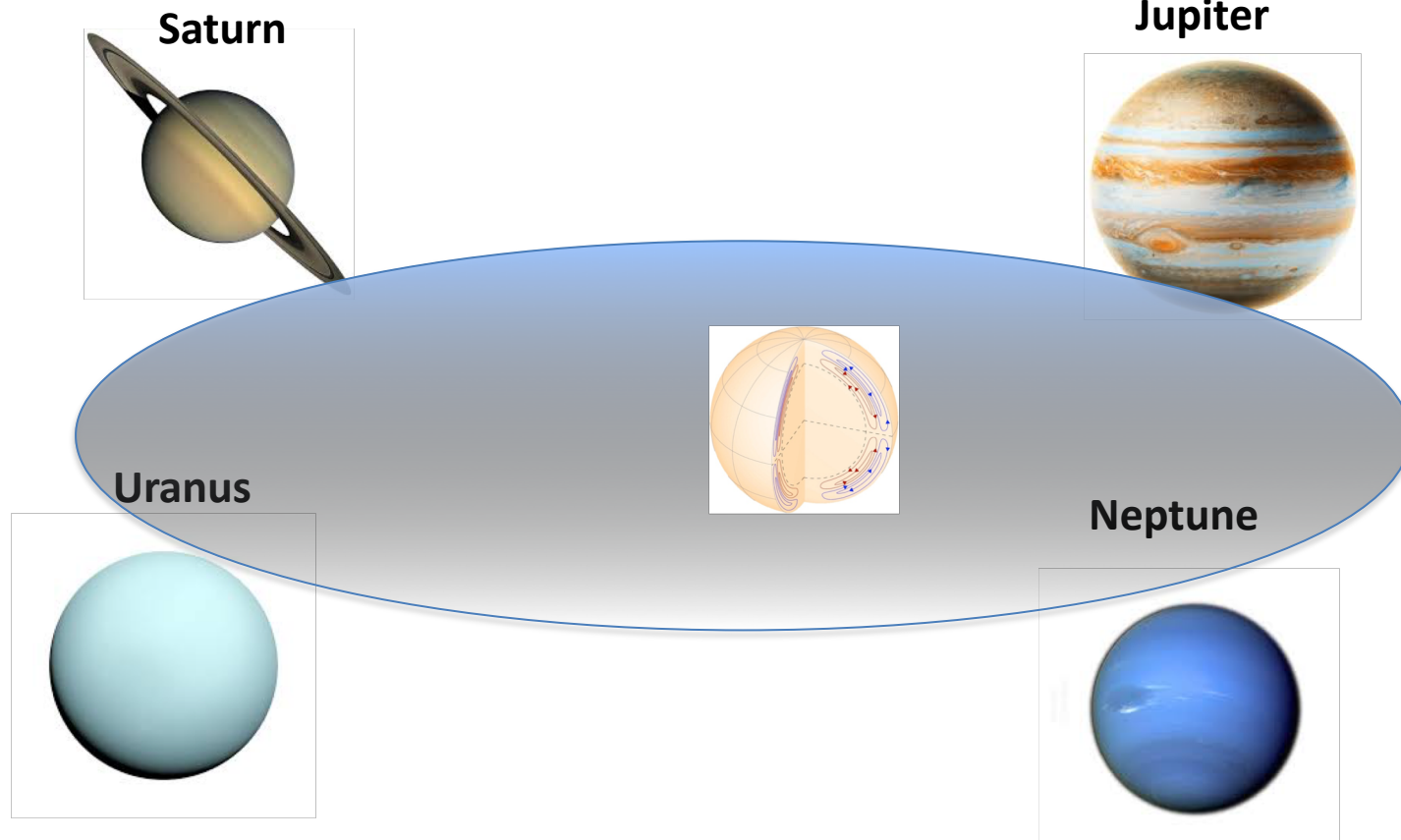


Periods: “Planets fingerprints”

- 11-yr => Jupiter; 29-yr => Saturn;
- 84-yr => Uranus; 167-yr => Neptune

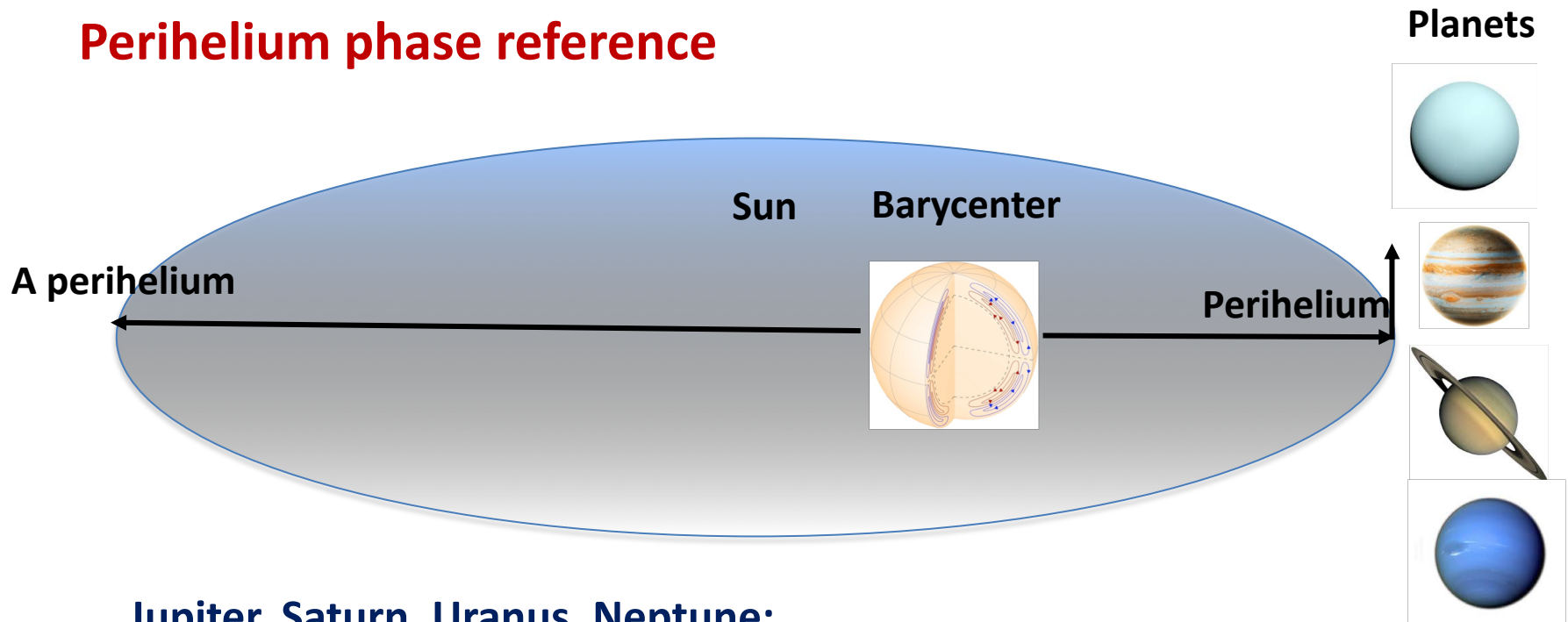
The Solar Clock

Represented by the 4 large planets



The Solar Clock

Perihelium phase reference



Jupiter, Saturn, Uranus, Neptune:

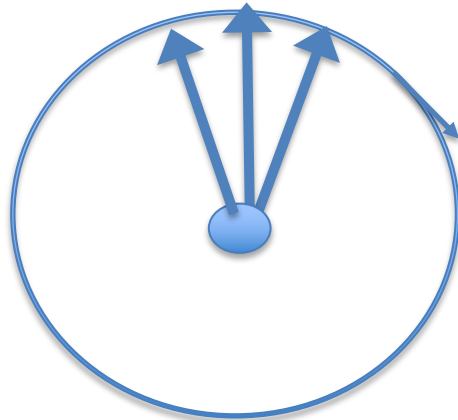
Barycenter: A spectrum of coincidence periods

(Yndestad and Solheim, 2017, New Astronomy)

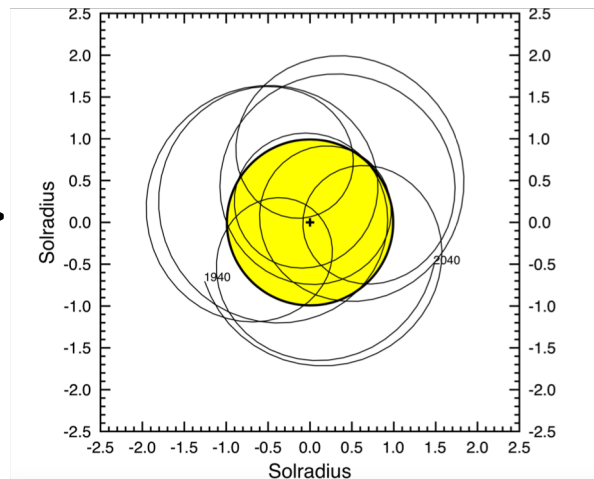
The Solar Clock

Solar position: Periods and phase-locked to large planets osc

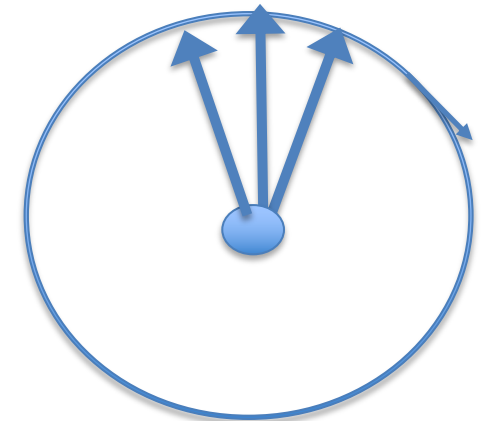
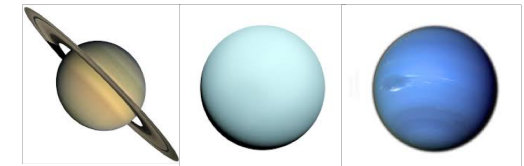
**Planets Position
Oscillation**



**Solar Barycenter oscillation
Gravity Oscillation**



**Solar Position
Oscillation**

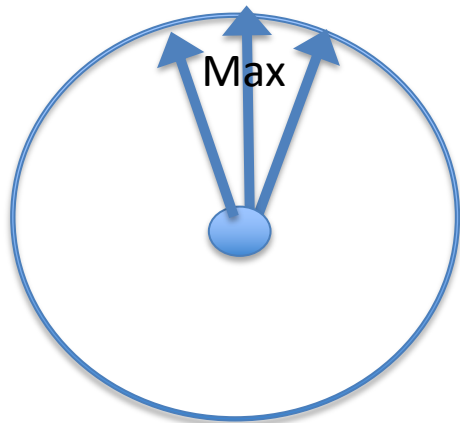


(Yndestad and Solheim, 2017, New Astronomy)

The Solar Clock

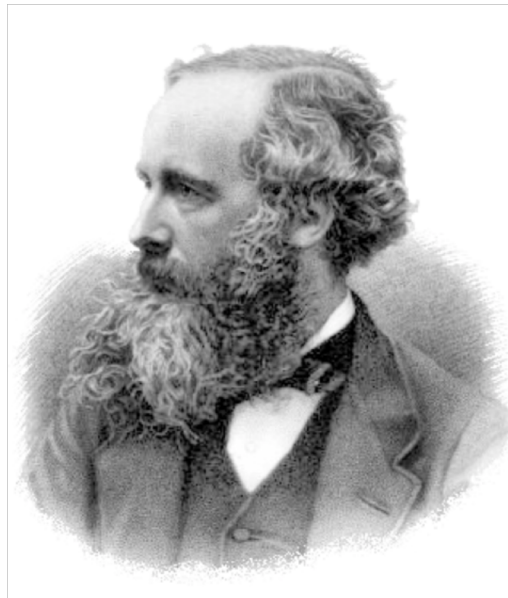
TSI periods: Periods and phase-locked to solar position

Solar position oscillation



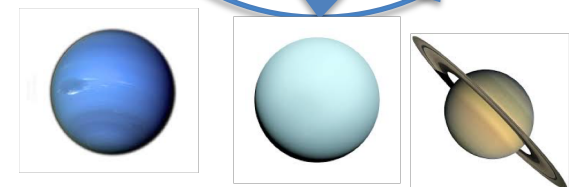
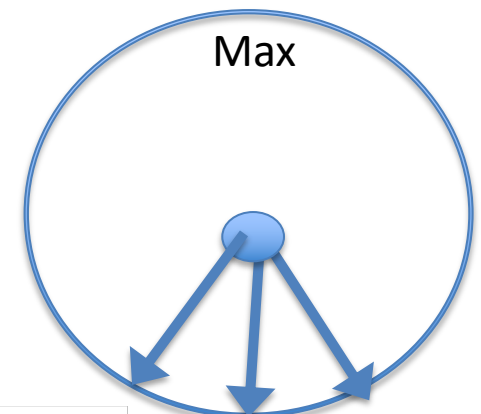
==>

**Solar plasma oscillation
Magnetic oscillation
(Maxwell)**



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Solar TSI oscillation

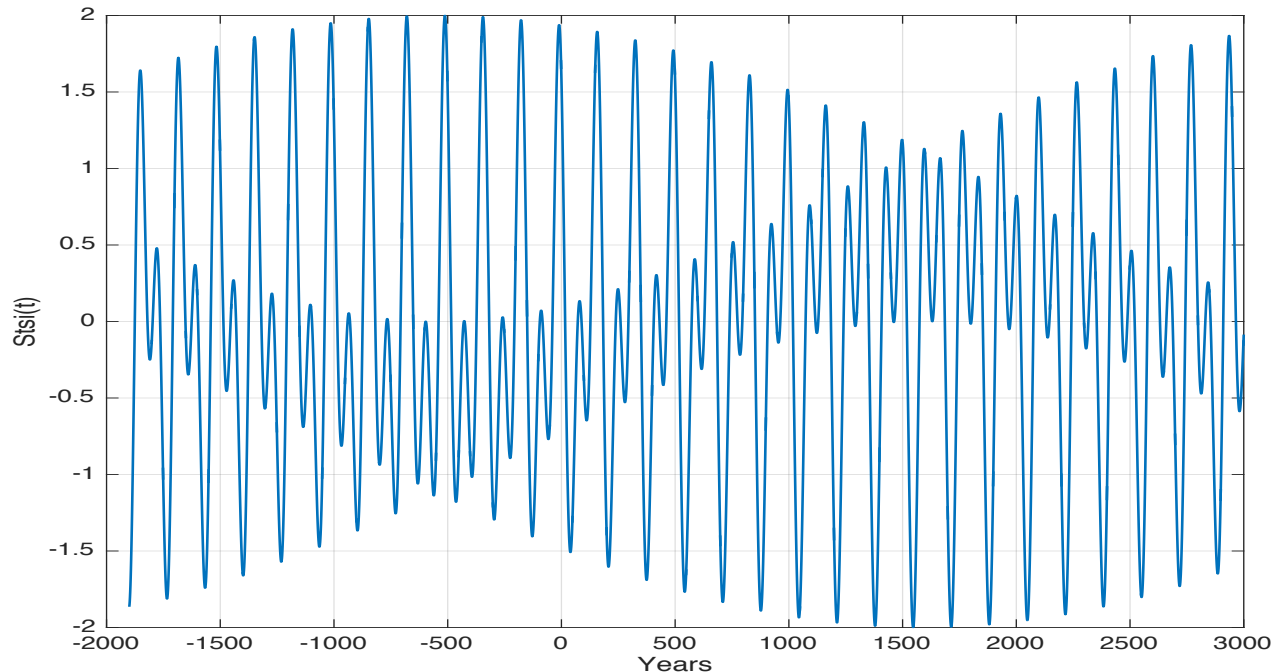


(Yndestad and Solheim, 2017, New Astronomy)

The Solar Clock

A spectrum of solar irradiation periods

Uranus-Neptune: Solar Model: 2000BC – 3000 AD



Uranus-Neptune: Period-phase coincidence: 4266 years

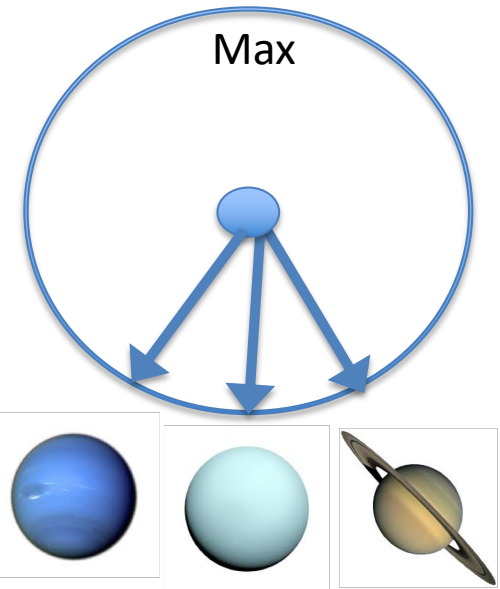
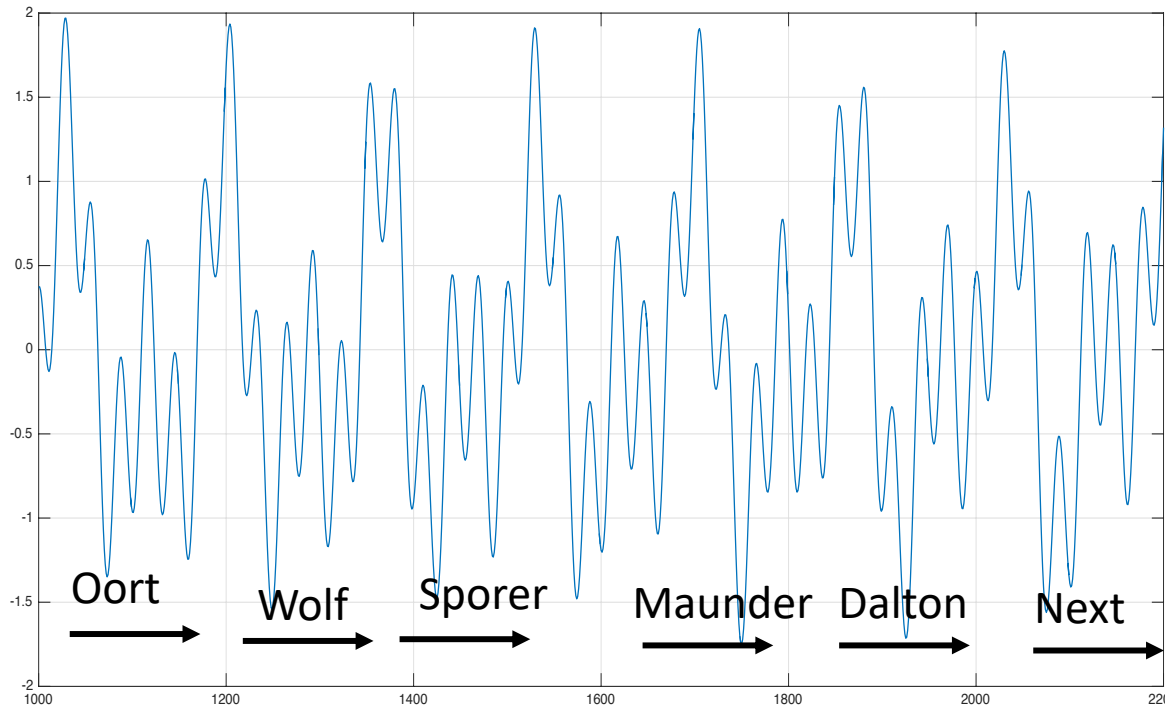
More solar irradiation: max 500 B.C – min 1500 A.D

Minimum periods: 178 years

The Solar Clock

A spectrum of solar irradiation periods

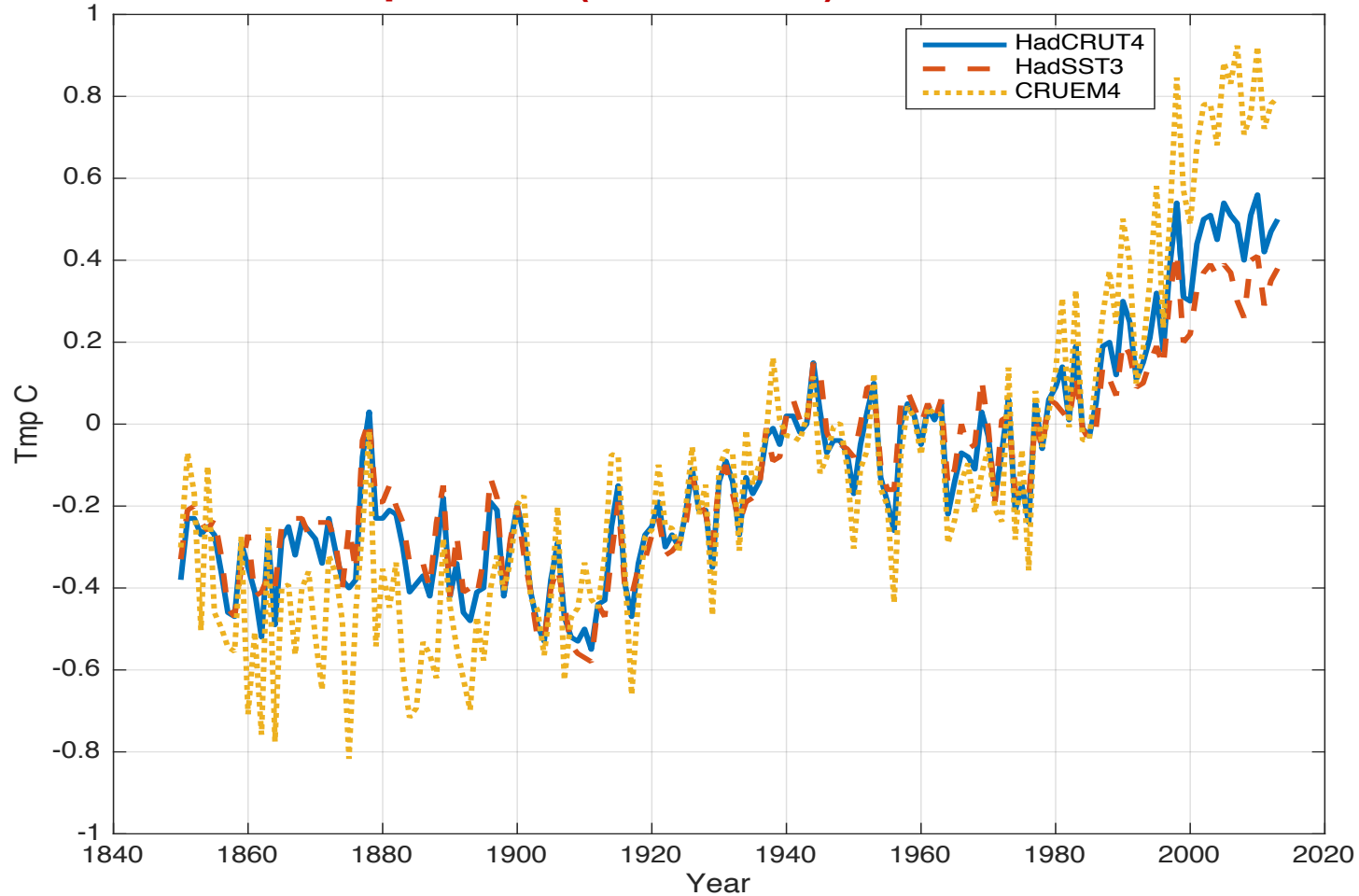
Saturn-Uranus-Neptune Model: 1000 – 2200 AD



**Deep minimum: Coincidences to known minimum solar periods:
Next deep solar minimum: 2060**

The Global Earth Temperature

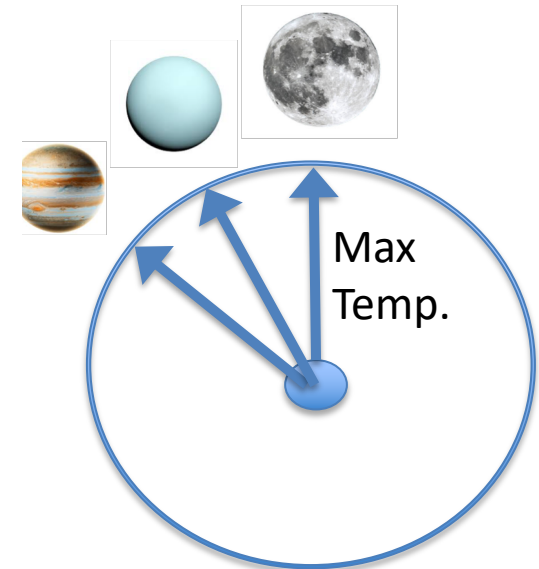
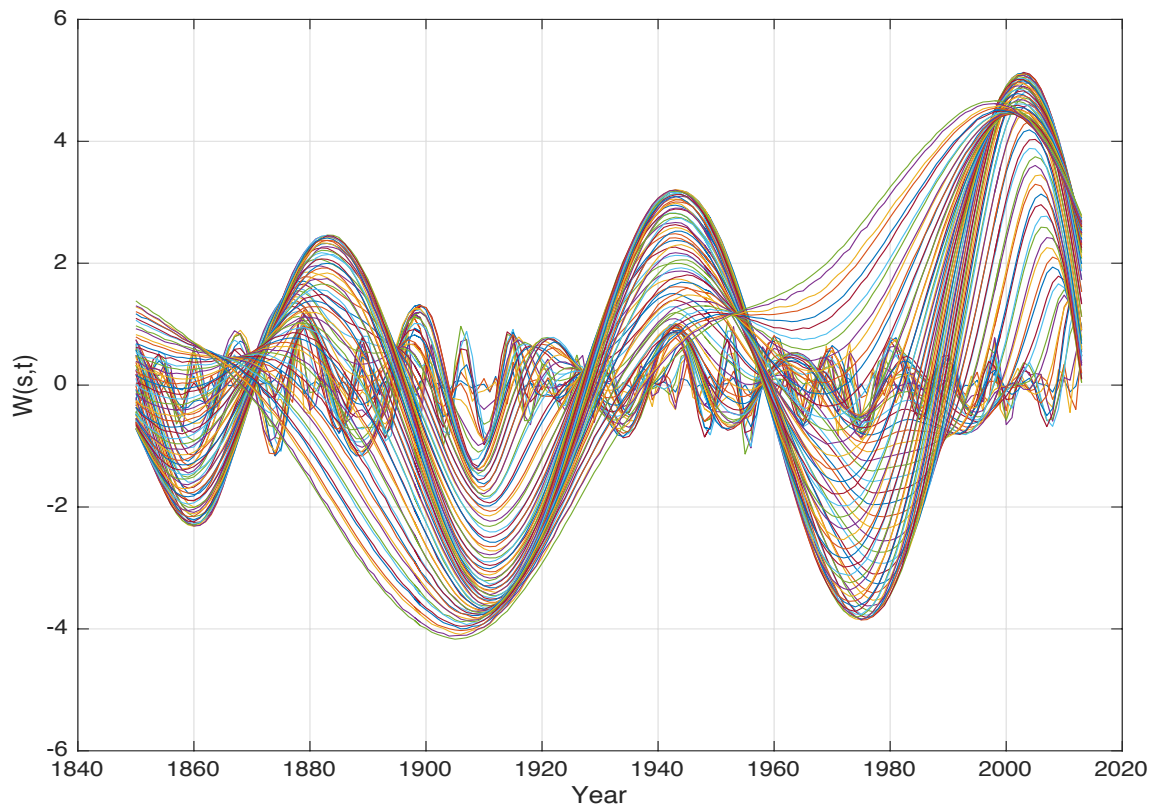
Global temperature (HadCRUT4): 1850 to 2017 AD



The Solar-Lunar Clock

**Global temperature:
Period and phase-locked to solar-lunar periods**

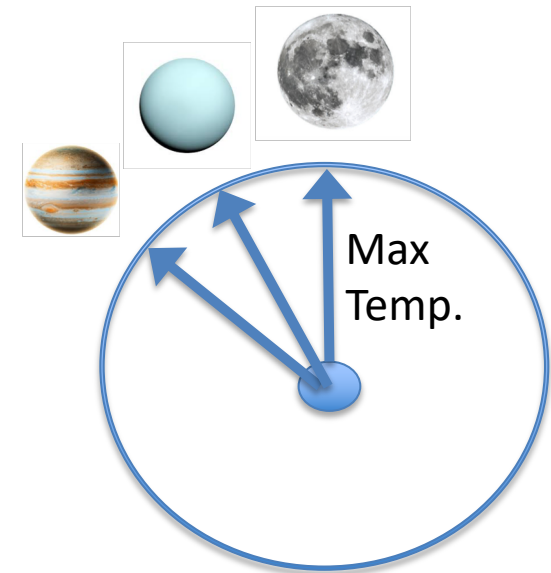
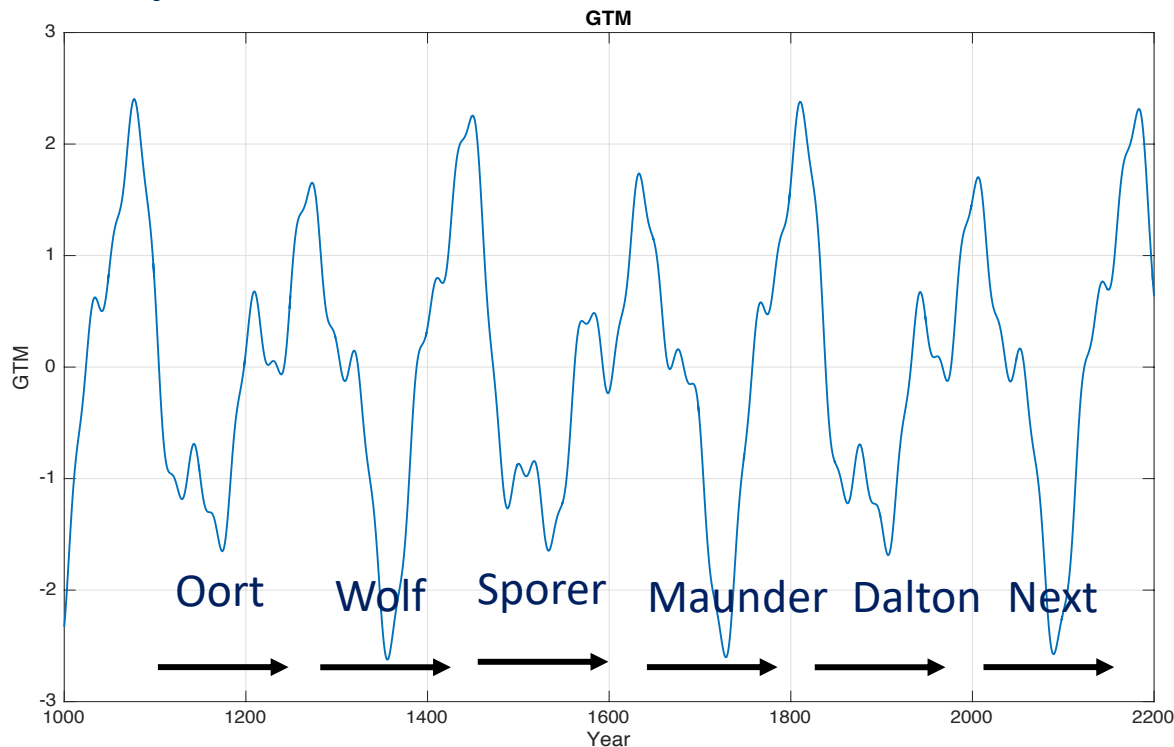
HadCRUTE4: wavelet spectrum



The Solar-Lunar Clock

Global Temperature Model: Solar minimum coincidence

Computed data series: 1000 - 2200 AD



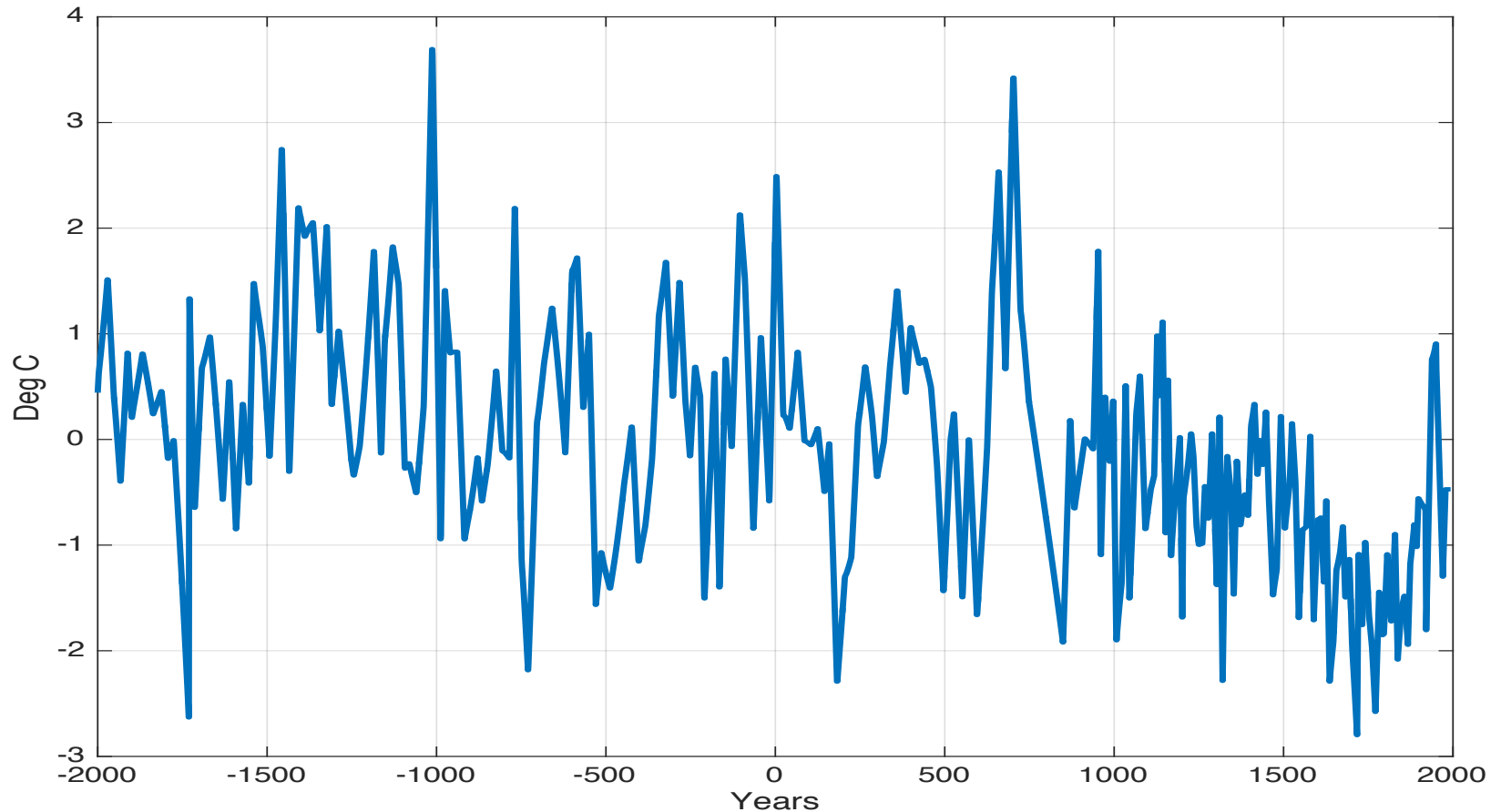
Period-phase locked to Solar-Lunar periods

Minimum temperature => Known minimum solar variability

Next deep minimum temperature: 2090 AD

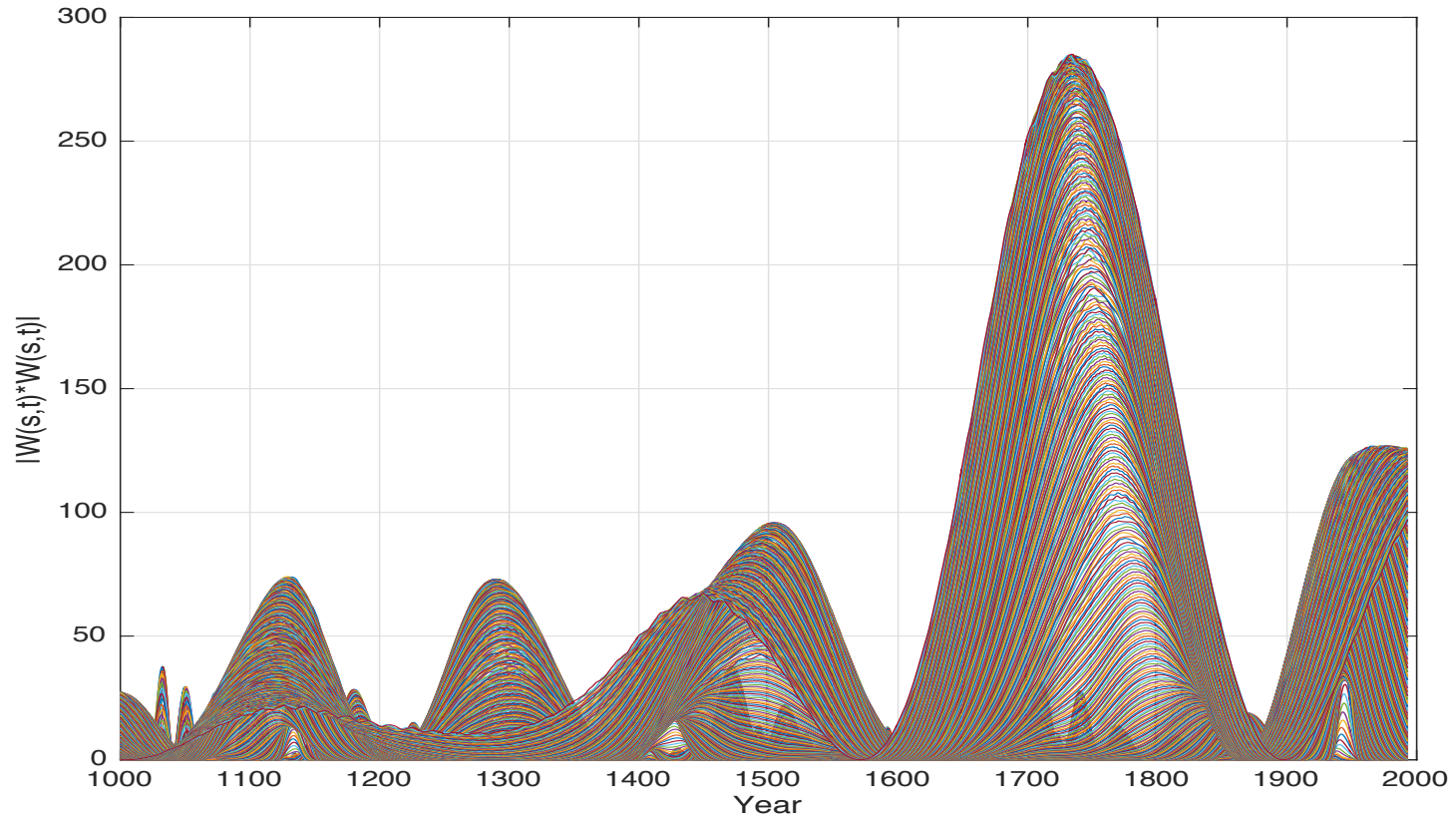
Greenland Temperature (GISP2)

4000 years: 2000 BC to 2000 AD



Greenland Temperature (GISP2)

Wavelet power spectrum: 1000 A.D to 2000 A.D



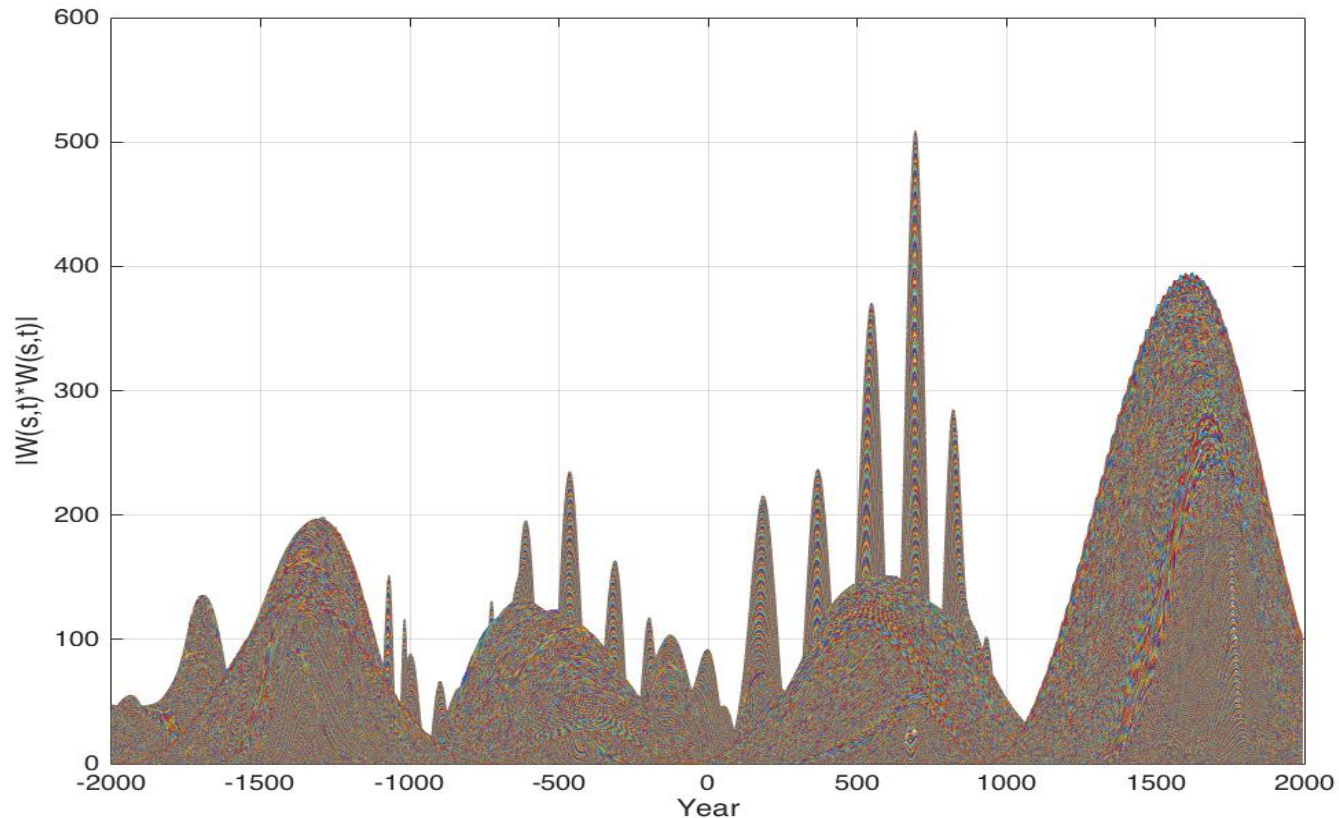
Period-Phase locked to Solar-Lunar periods

Modern warm period: 1840 – 2050 AD

Next cold period: 2050 – 2160 AD; Deep minimum: 2155 AD

Greenland Temperature (GISP2)

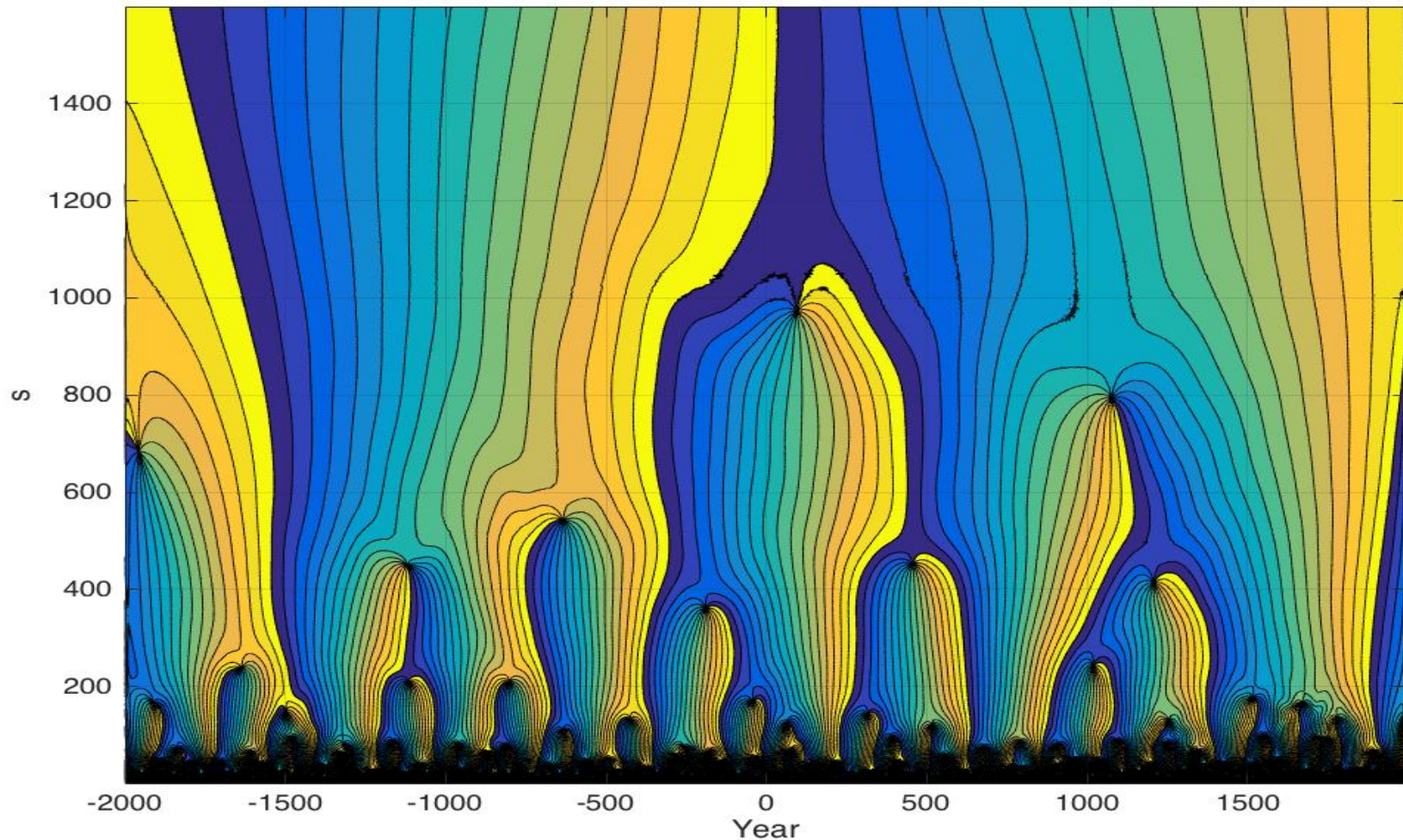
Wavelet power spectrum: 2000 BC to 2000 AD



Period-phase locked to Solar-Lunar spectrum
Stationary 2046-yr period (Hallstatt-period)
Cold period: 1100 AD – 2150, Minimum: 1613

The Solar-Lunar Climate Clock

Greenland temperature: Climate shifts 2000 BC – 2000 AD



Summary

Independent data series show the same results

	Oort	Wolf	Spører	Maunder	Dalton	Next 1	Next 2
Solar minimum (Usoskin,)	1040	1305	1470	1680	1805		
Sunspots minimum (Yndestad, Solem, 2017)	1026	1249	1473	1696	1811	2035	
TSI-LS minimum (Yndestad, Solam, 2017)	1035	1289	1418	1672		2060	
Solar Model Minimum	1074	1249	1425	1749	1865	2050	2250
Solar-Lunar Model Minimum	1075	1245	1428	1747	1895	2100	2250
Global Temperature Model (HadCRUTE4)		1354		1729		2090	
Greenland 420-yr (GISP2-1k)		1290		1754		2155	
Greenlan 2046-yr (GISP2-4m)				1613			

Thank you

