The Climate Clock

Prof. em. Harald Yndestad

Norwegian University of Science and Technology

Norwegian University of Science and Technology

NTNU

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)

My research periods

1975-1995: Cybernetics, Signal theory
1995-2009: Lunar tide => Climate => Ecosystems
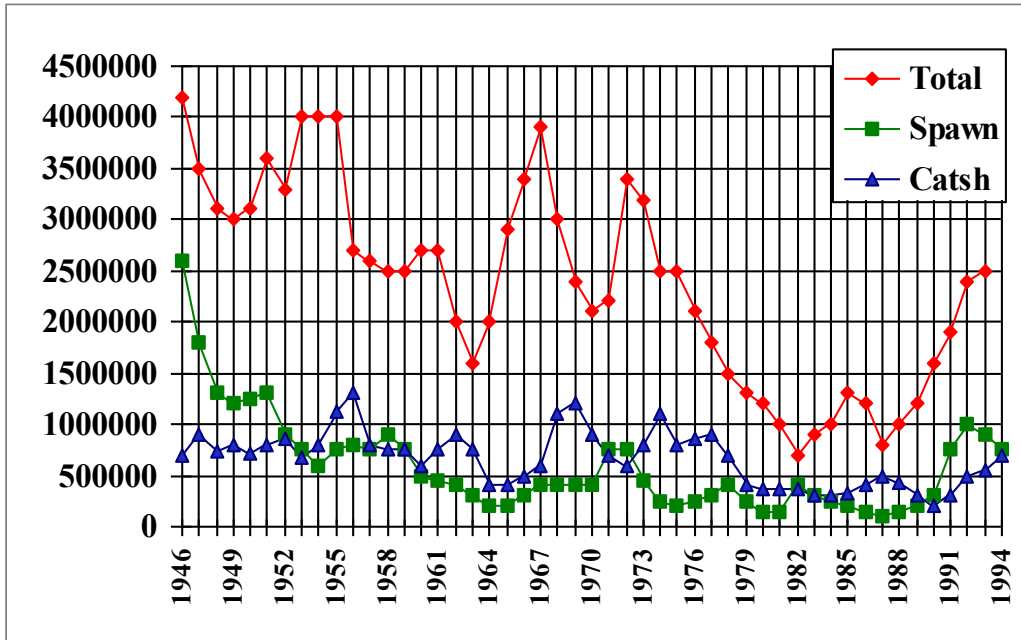2014-2016: Solar variability
2016-2018: Global Climate variability

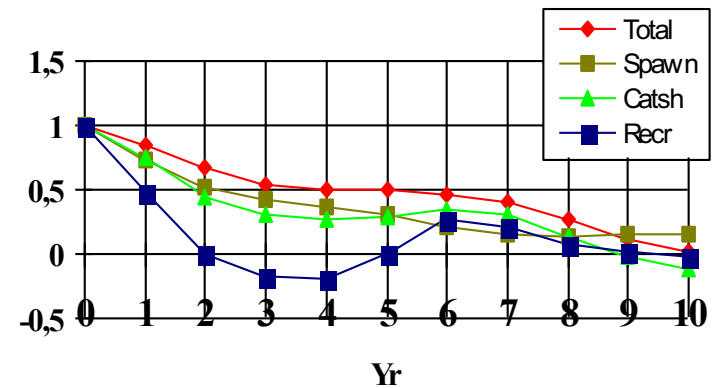# The fishery was growing

Until the fish disappeared, but why?

Ålesund,
Norway,

The research question

Cod biomass time series x(t)

The autocorrelation

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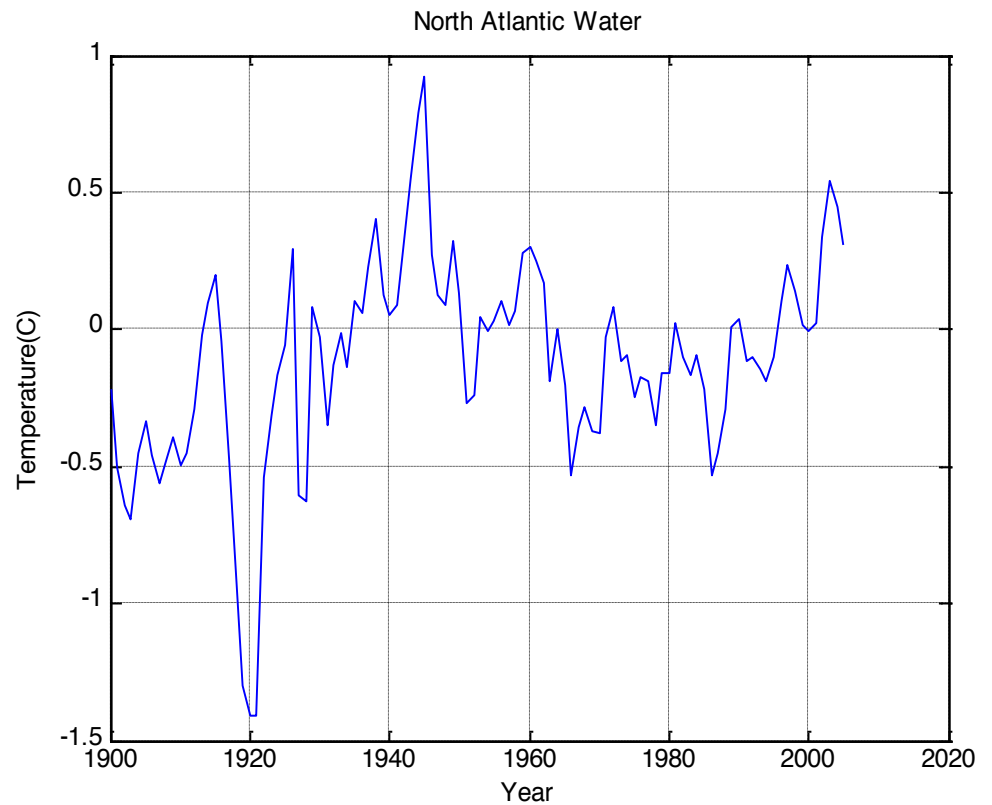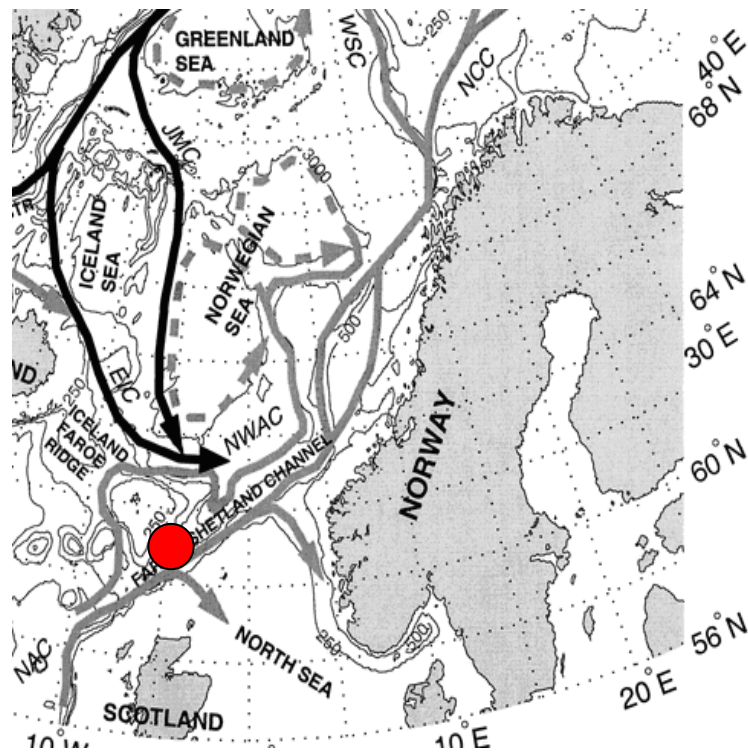v(t): random spectrum

Q: A stationary cycle in the biomass of Northeast Arctic cod?
A: If so, we may predict future biomass fluctuations
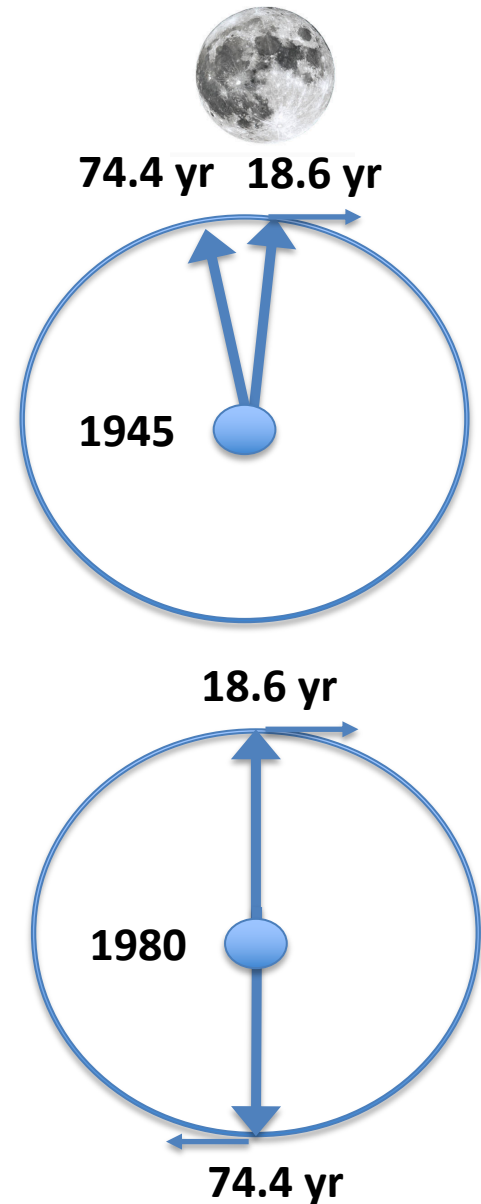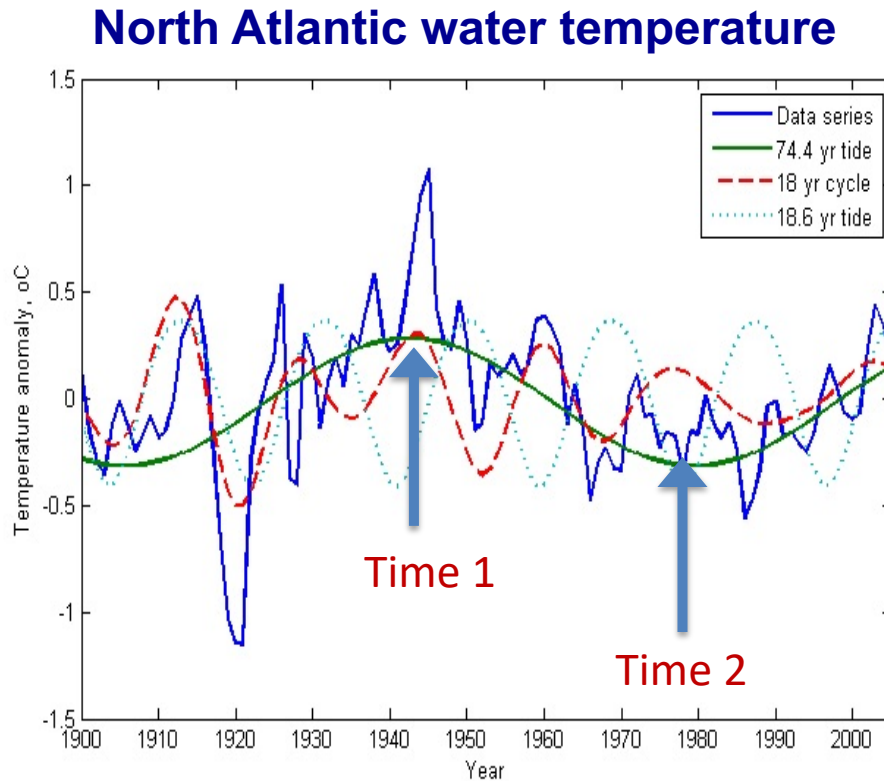   **If not, limit possibilities of forecasting**

North Atlantic Water temperature

Climate indicator

The Lunar Clock

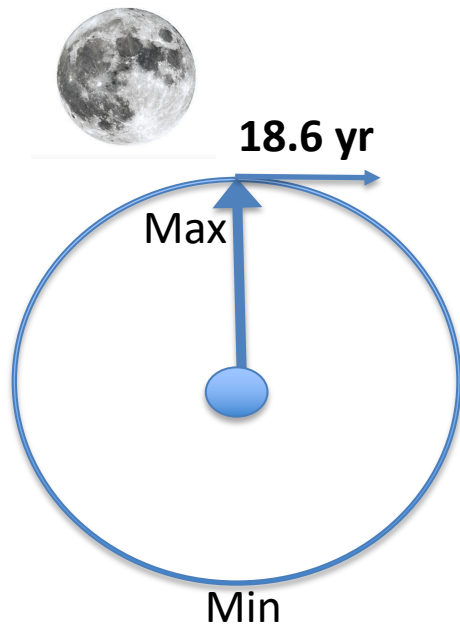**A 18.6-yr period spectrum
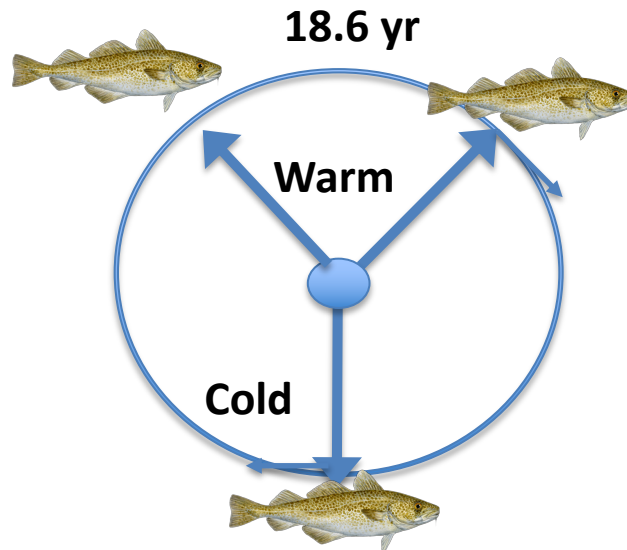Controlled by the Moon**

The Lunar Clock

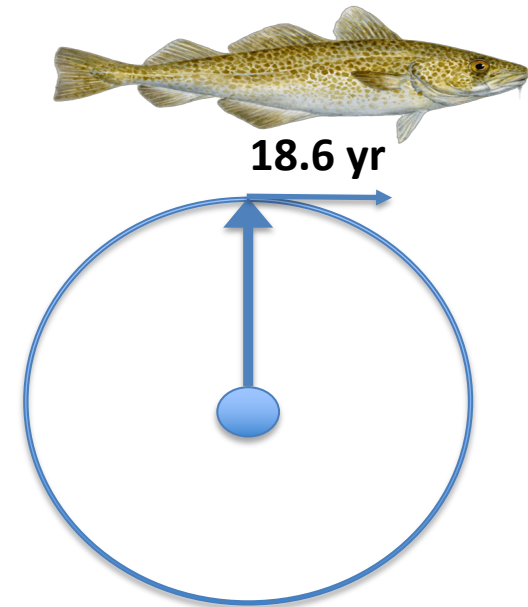**Cod biomass: Period and phase-locked to the 18.6 yr Lunar temperature period**

Ocean: Temperature

Cod spawning period
18.6/3= 6.2 yr

Cod biomass
18.6 yr

18.6 yr

Max

Min

18.6 yr

Warm

Cold

+0.5 degree => 20 time
more cod recruitment

18.6 yr

The Lunar Clock

The 18.6-yr lunar period phase-lag

Earth nutation
The Earth axis
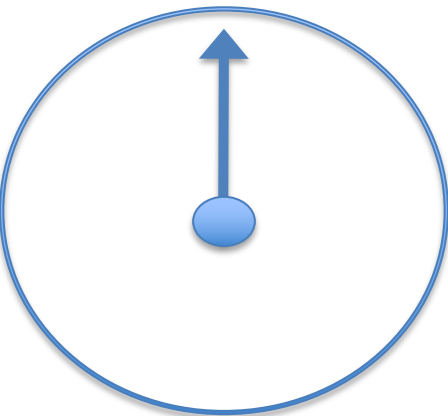
Lunar nodal tide
Ocean currents
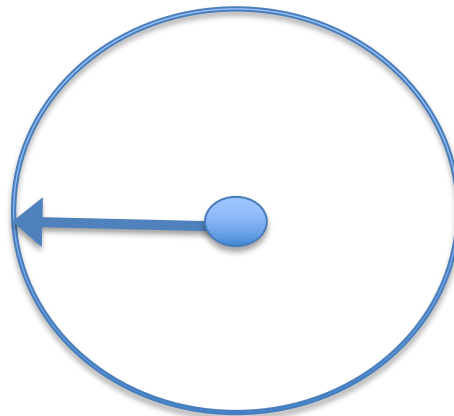
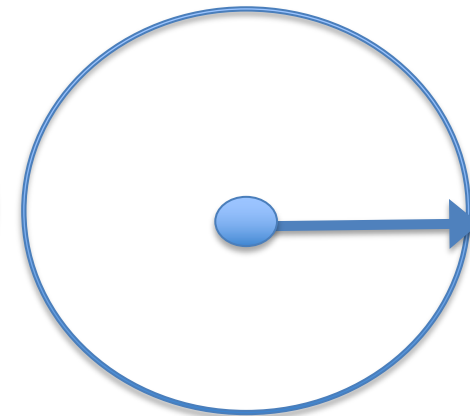**Lunar periods**
Ocean temperature
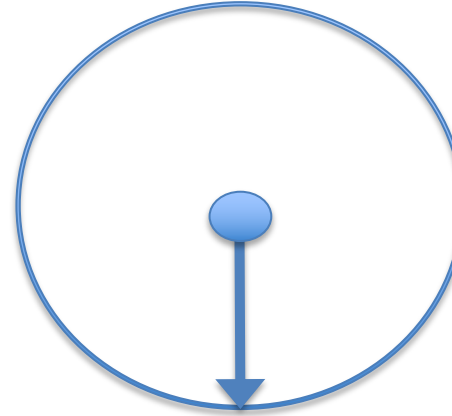
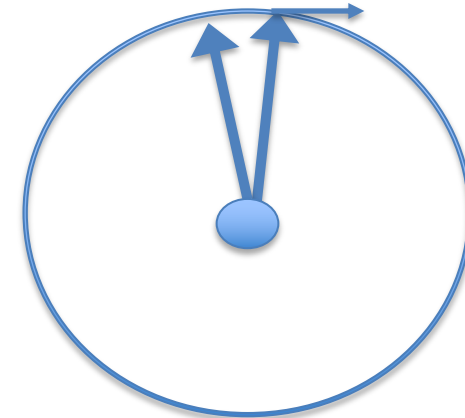**Lunar periods**
NAO-index
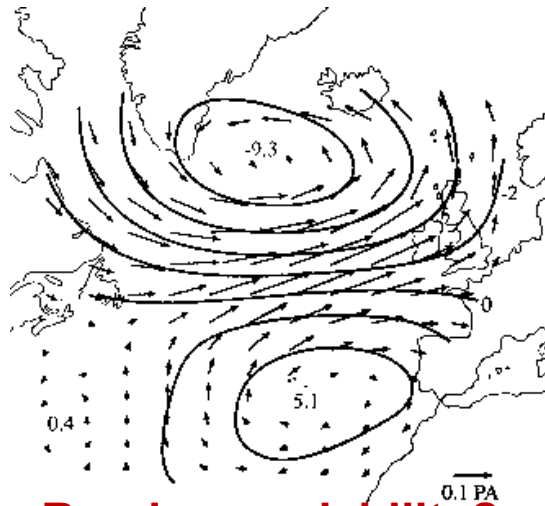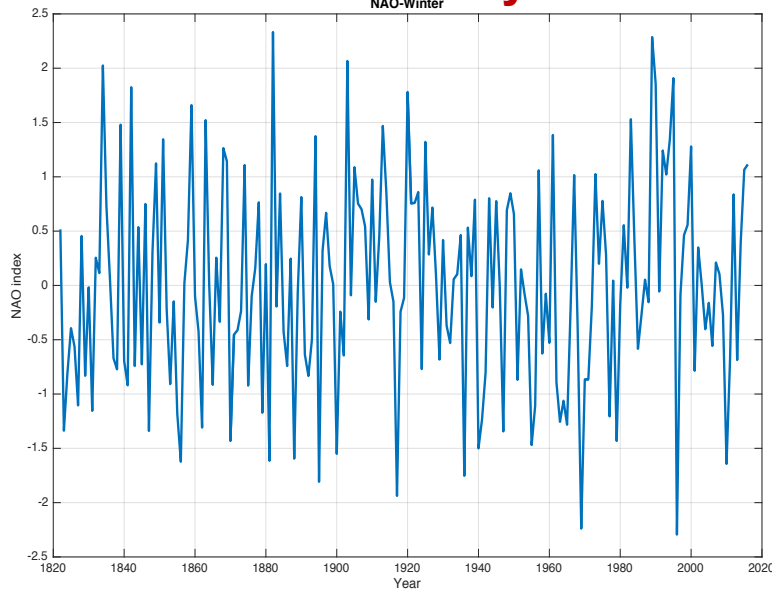
18.6 yr

18.6 yr

18.6 yr

18.6 yr

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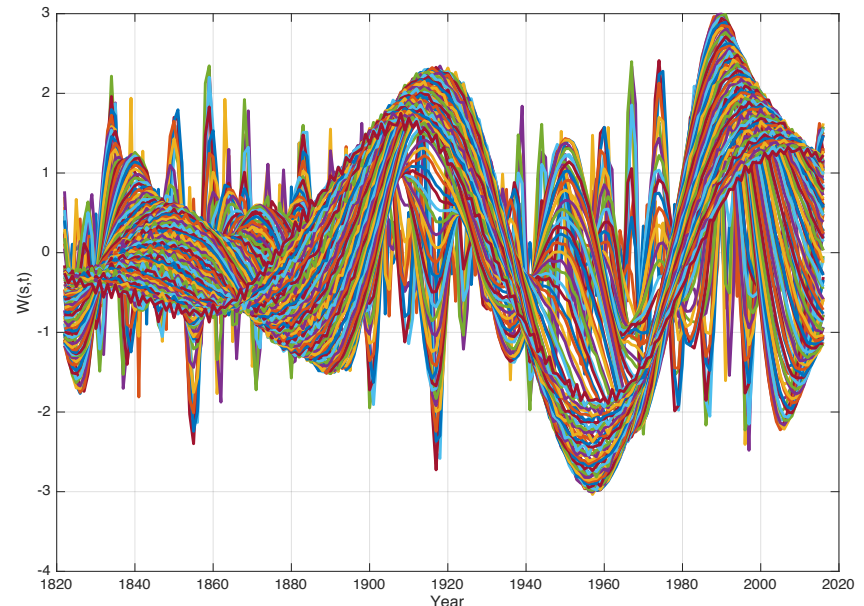**The Lunar Clock need a reference**

The Lunar Clock

North Atlantic Oscillation (NAO-index)

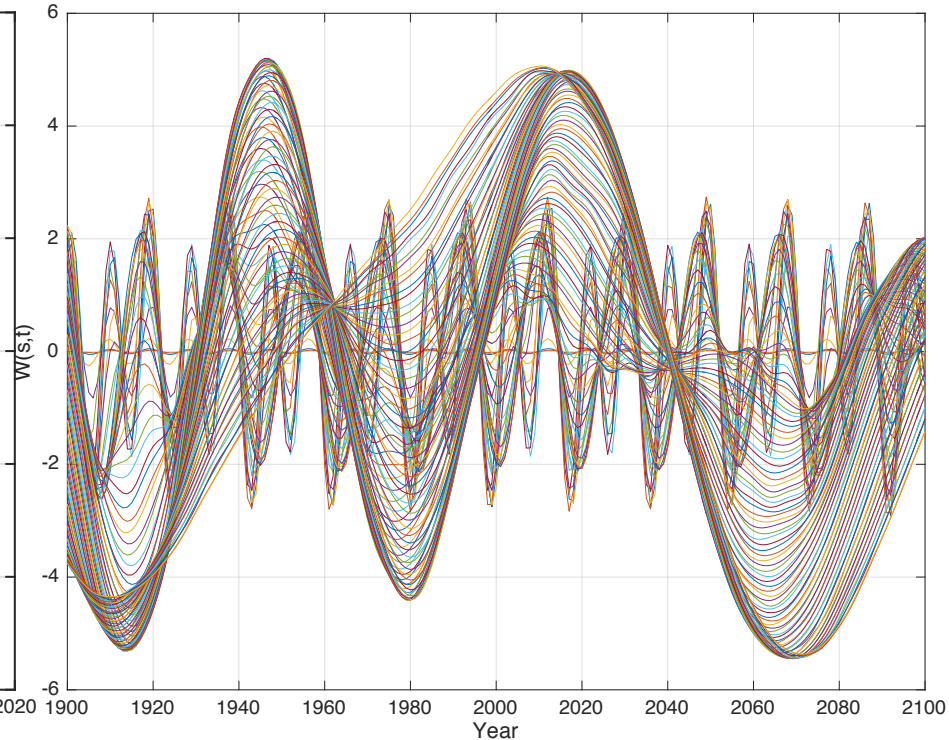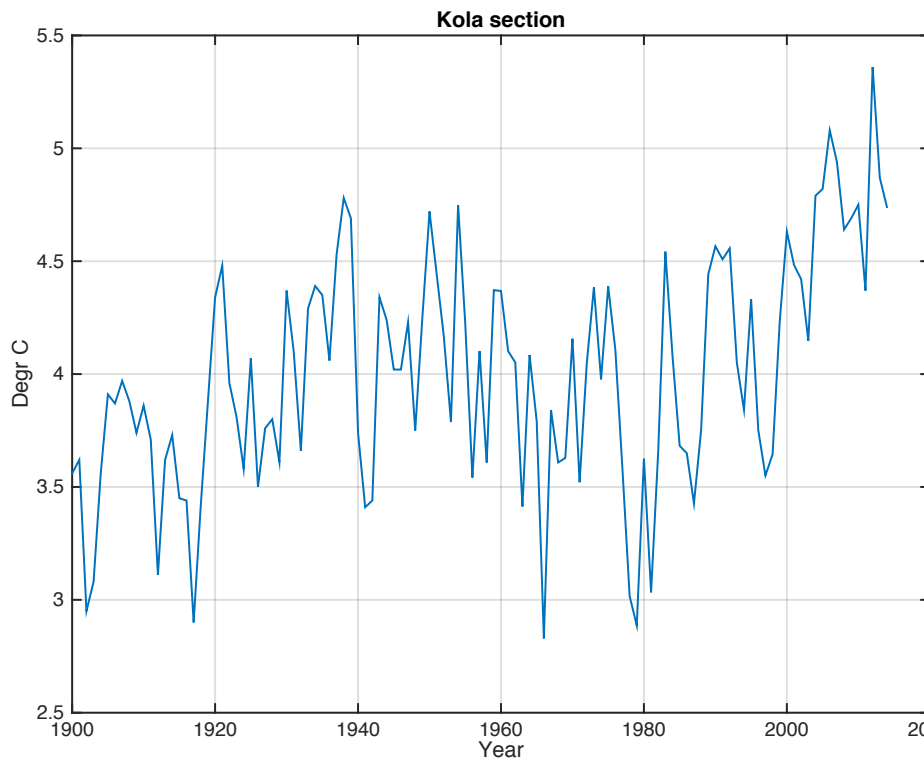**74.4 yr   18.6 yr**
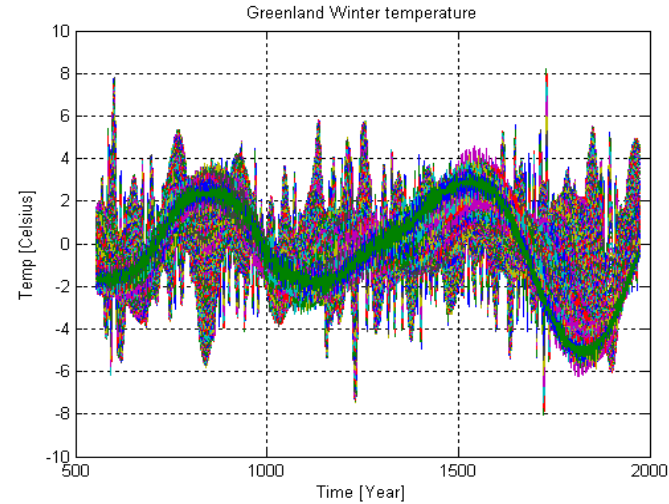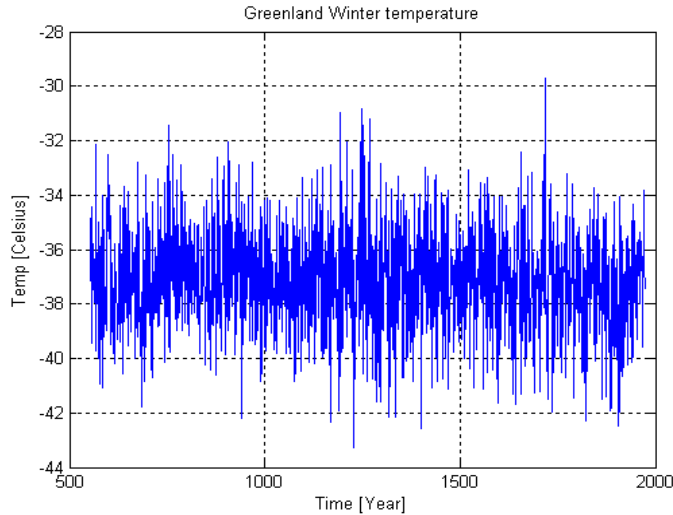

Random variability?

Period- and phase-locked

The Lunar Clock, is ticking

and, the Barents Sea temperature is turning

Greenland temperature variability

Wavelet spectrum

Greenland Winter temperature

Selected nodal cycle of 186 years
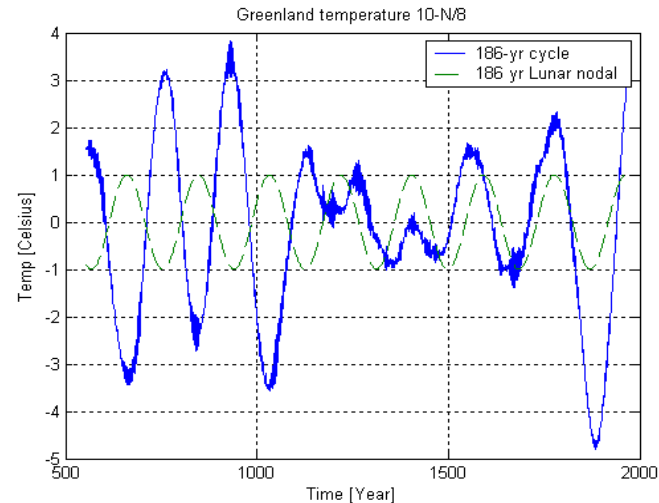
Stationary periods:
186-yr period: Next minimum 2040
Deep minimum 2105

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

A force

TSI variability

Total Solar Irradiation periods

ACRIM TSI (Hoyt-Schatten)
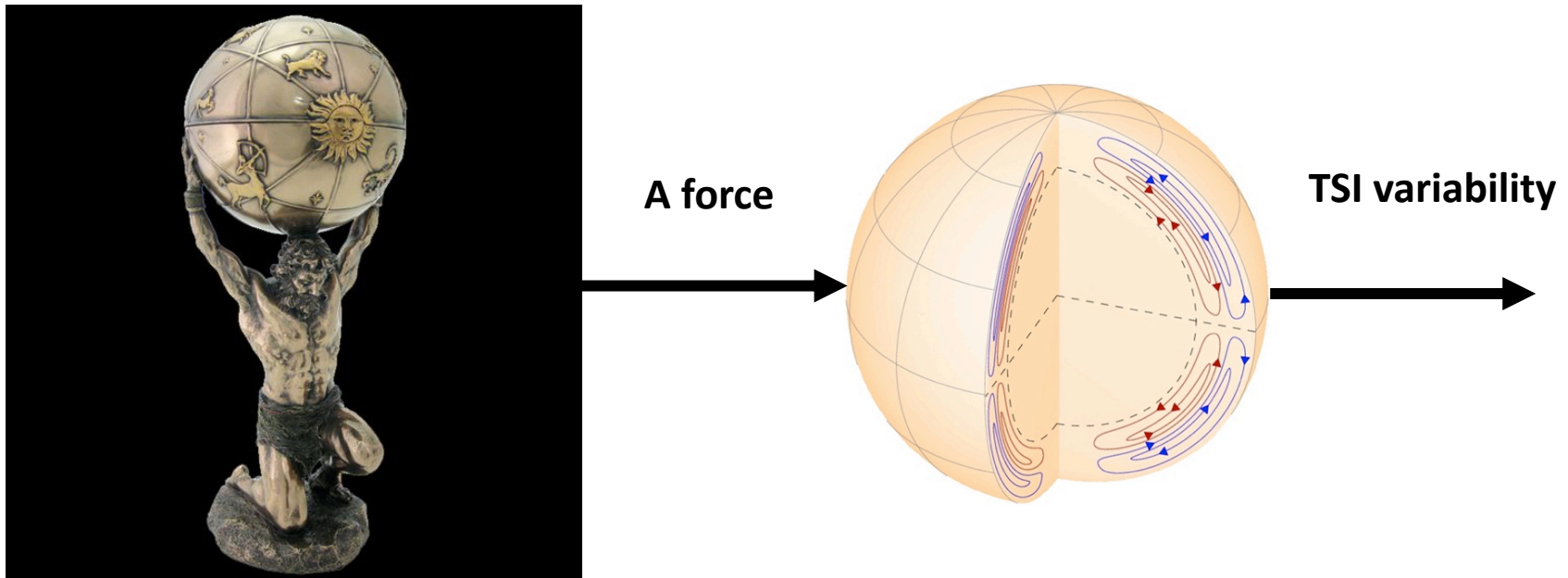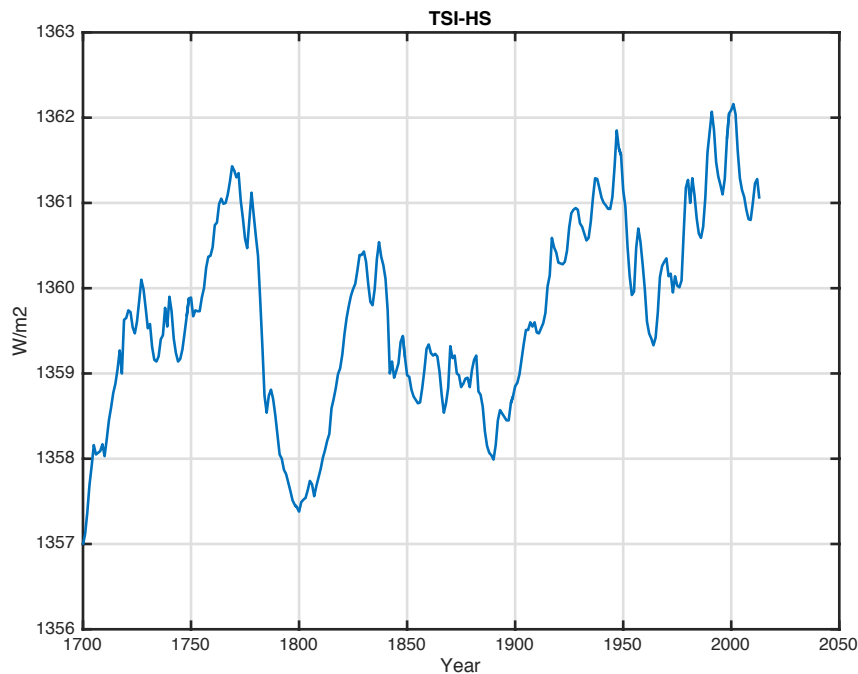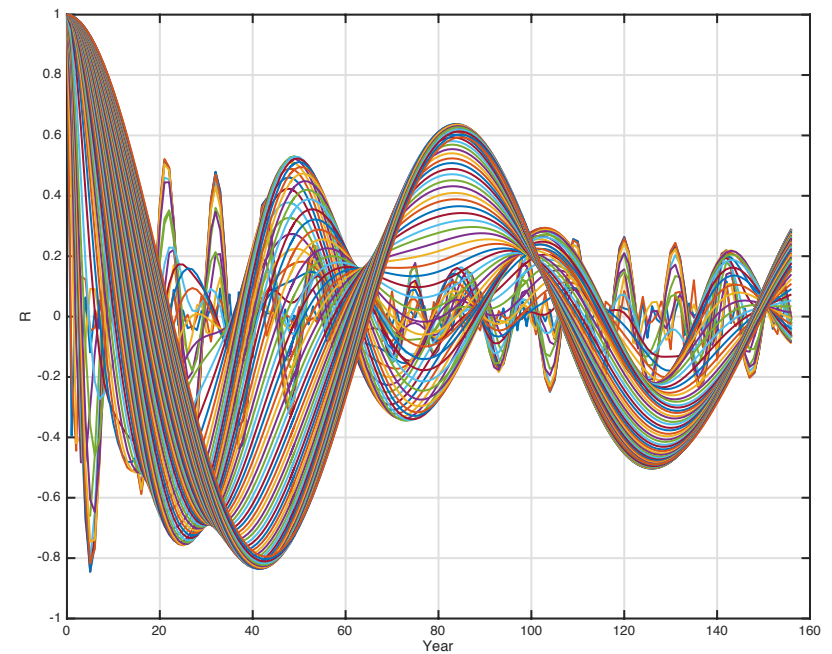
(Scafetta and Willson 2014)

(Yndestad and Solheim, 2017, New Astronomy)

Autocorrelations of the
Wavelet spectrum

Periods: "Planets fingerprints"
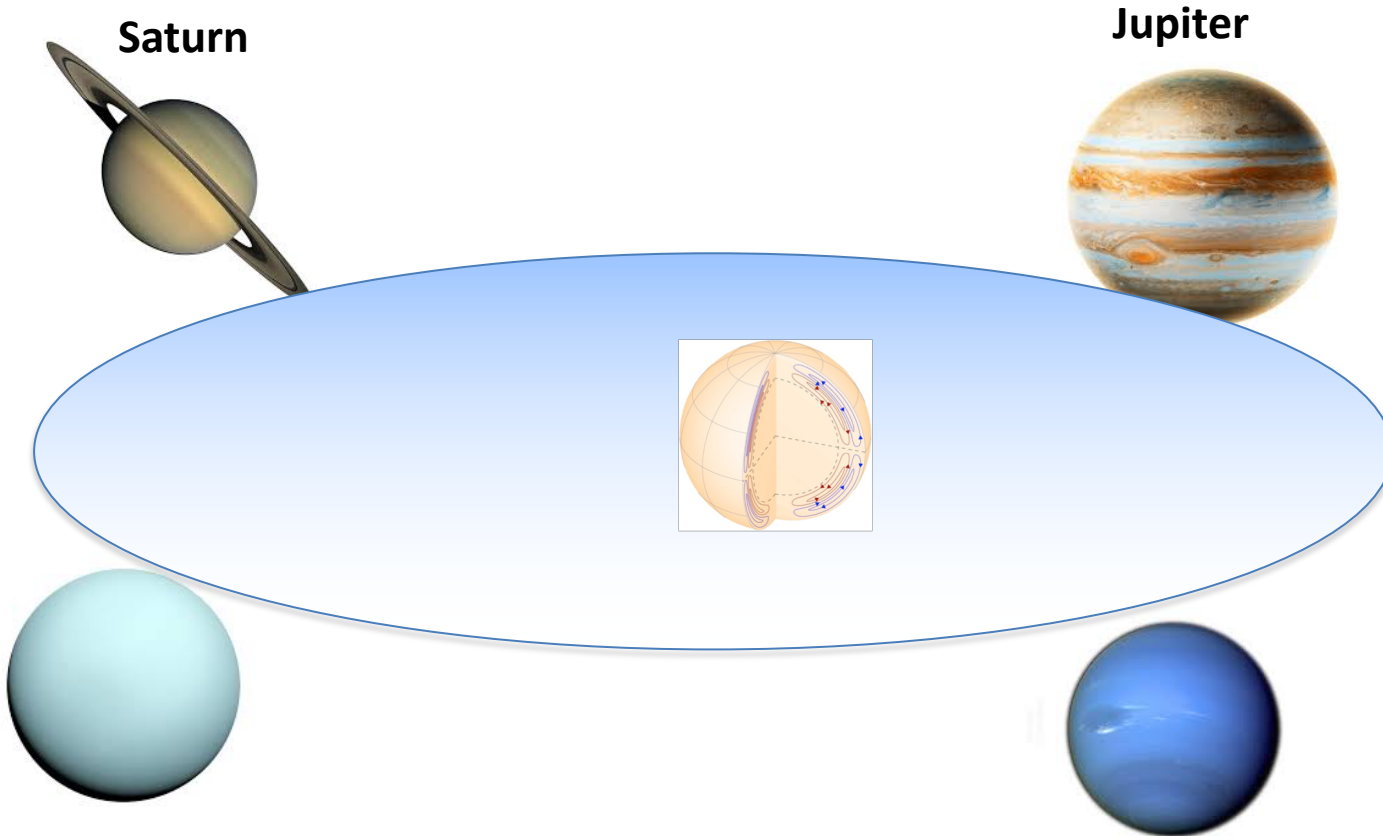-   11-yr => Jupiter; 29-yr => Saturn;
-     84-yr => Uranus; 167-yr => Neptune

The Solar Clock

Represented by the 4 large planets

The Solar Clock

Perihelium phase reference

Planets

Sun   **Barycenter**

A perihelium

Perihelium
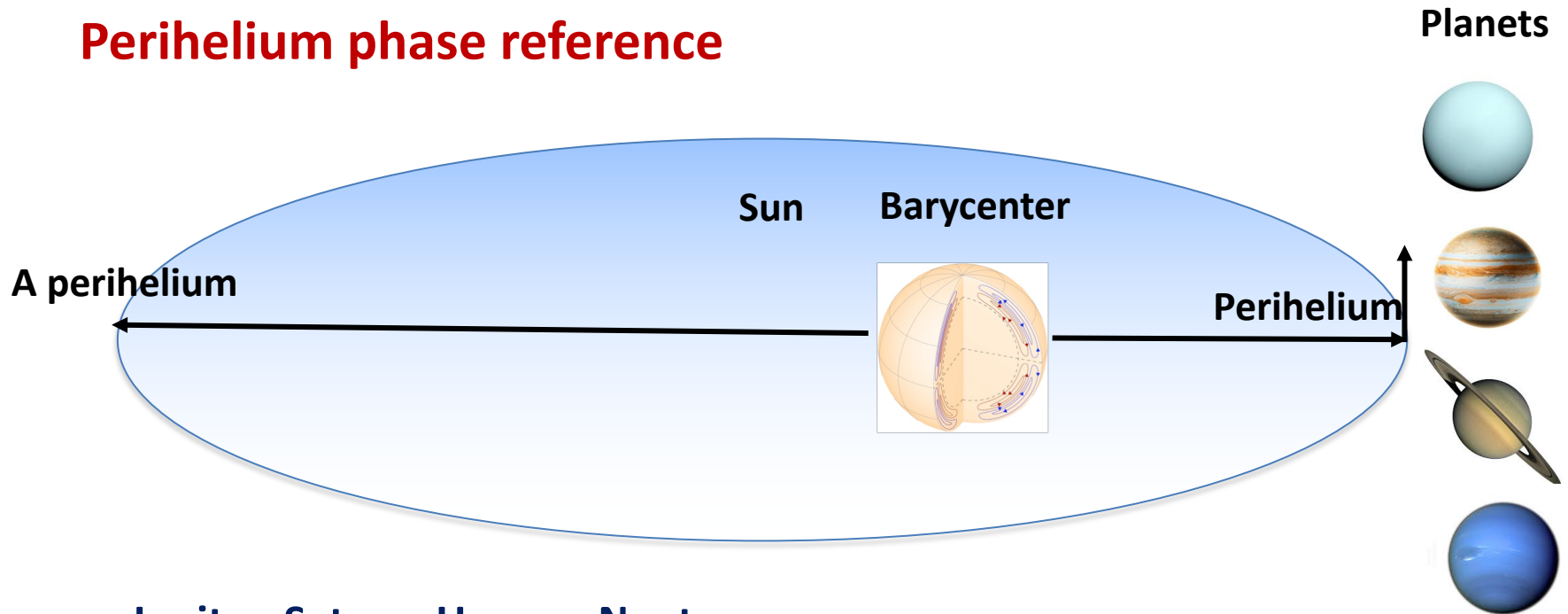
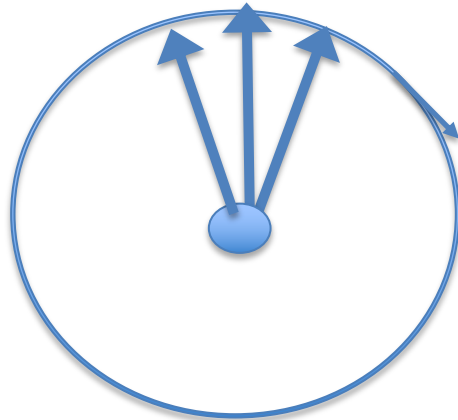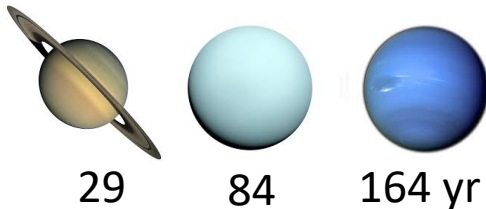**Jupiter, Saturn, Uranus, Neptune:**
Barycenter: A spectrum of coincidence periods

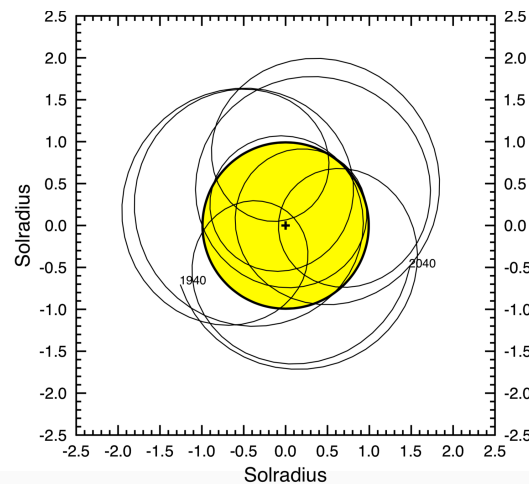(Yndestad and Solheim, 2017, New Astronomy)

The Solar Clock

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

Planets Position Oscillation

29   84   164 yr

Solar Barycenter oscillation Gravity Oscillation

Solar Position Oscillation

==>   ==>
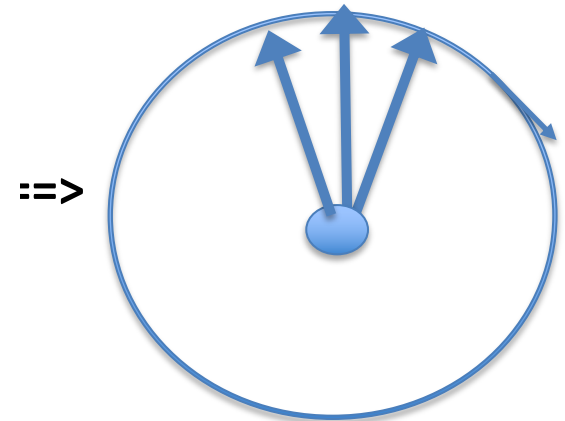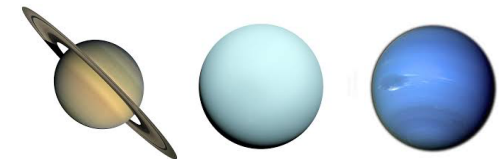
(Yndestad and Solheim, 2017, New Astronomy)

The Solar Clock

TSI periods: Periods and phase-locked to solar position

Solar position oscillation
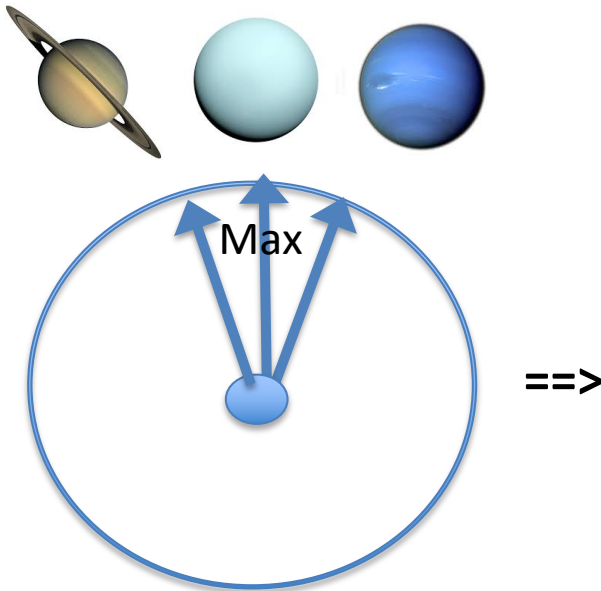
Solar plasma oscillation
Magnetic oscillation
(Maxwell)

Solar TSI oscillation

Max

==>

==>

Max
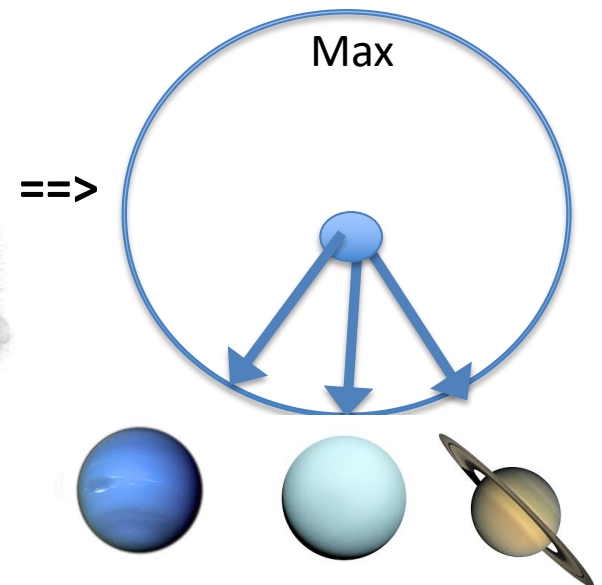
(Yndestad and Solheim, 2017, New Astronomy)

The Solar Clock

A spectrum of solar irradiation periods

Uranus-Neptune: Solar Model: 2000BC – 3000 AD
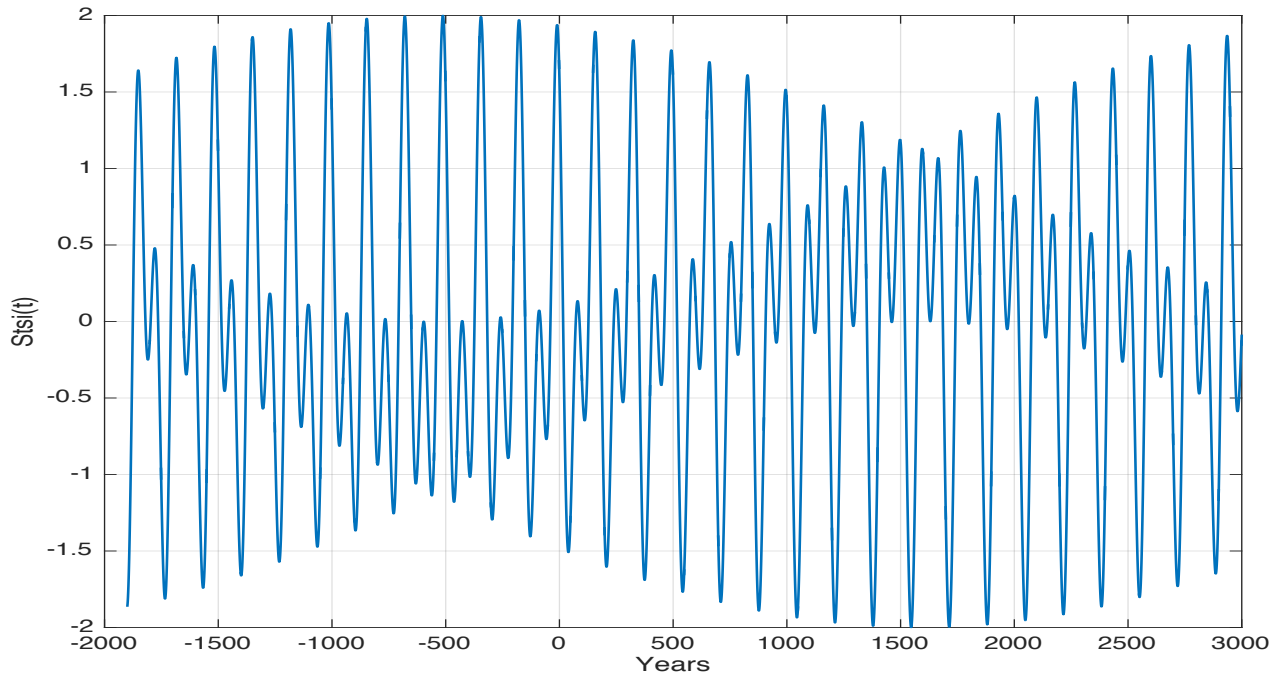
Uranus-Neptune: Period-phase coincidence: 4266 years

More solar irradiation: max 500 B.C – min 1500 A.D
Minimum periods: 178 years

The Solar Clock

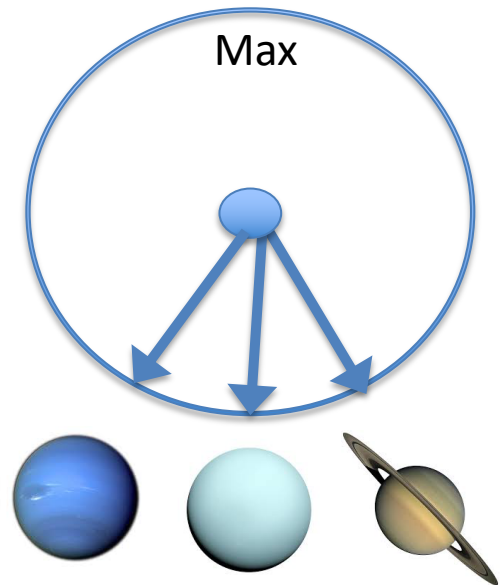## A spectrum of solar irradiation periods

Saturn-Uranus-Neptune Model: 1000 – 2200 AD

Oort Wolf Sporer Maunder Dalton Next

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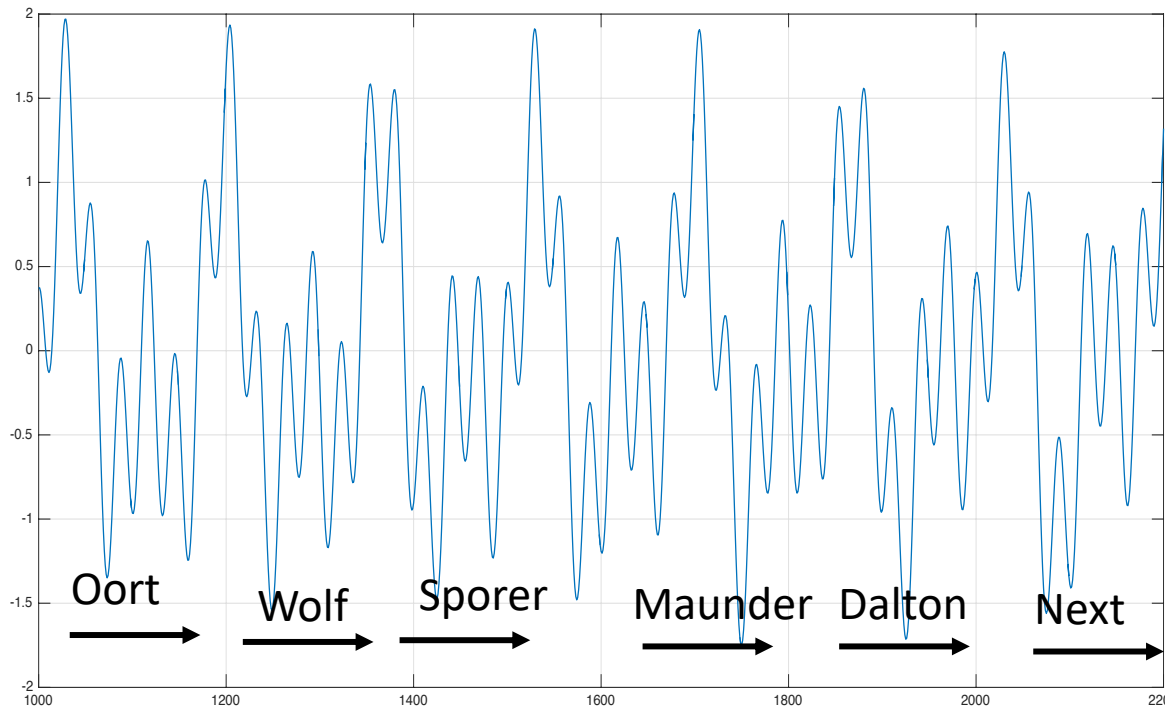
Deep minimum: Coincidences to known minimum solar periods:
Next deep solar minimum: 2060

The Global Earth Temperature

Global temperature (HadCRUT4): 1850 to 2017 AD
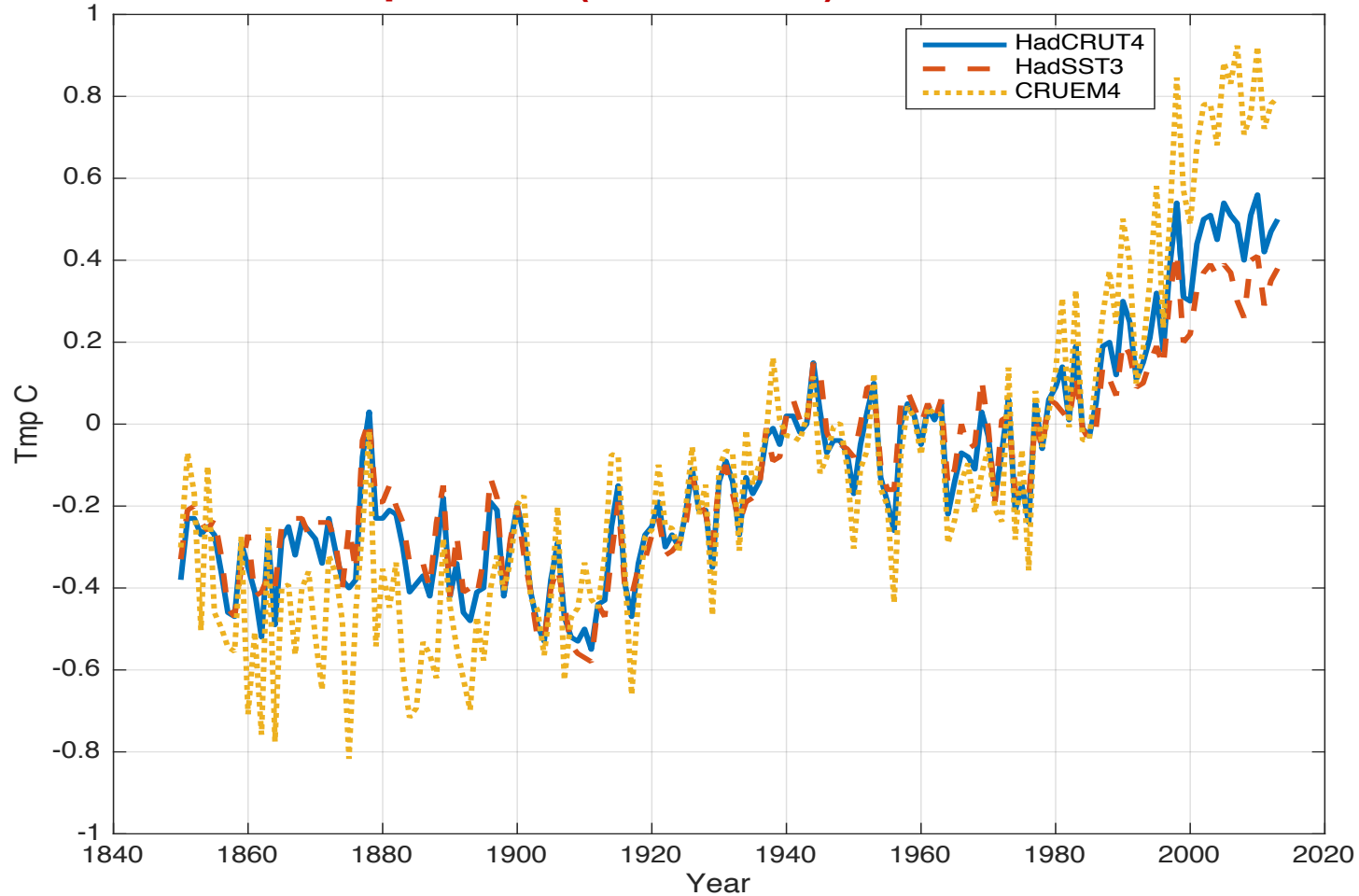
The Solar-Lunar Clock

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

HadCRUTE4: wavelet spectrum
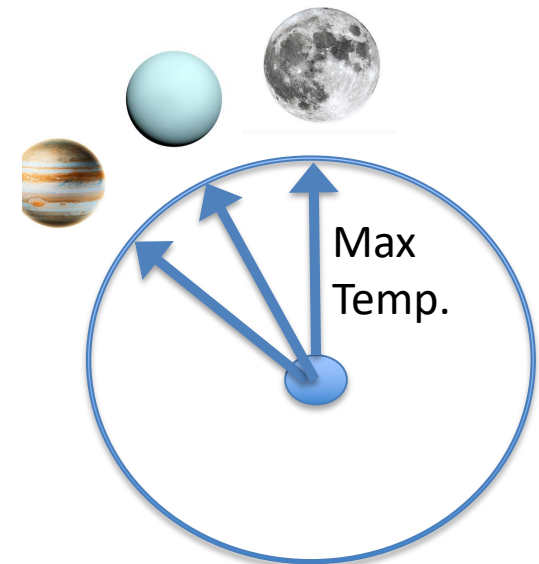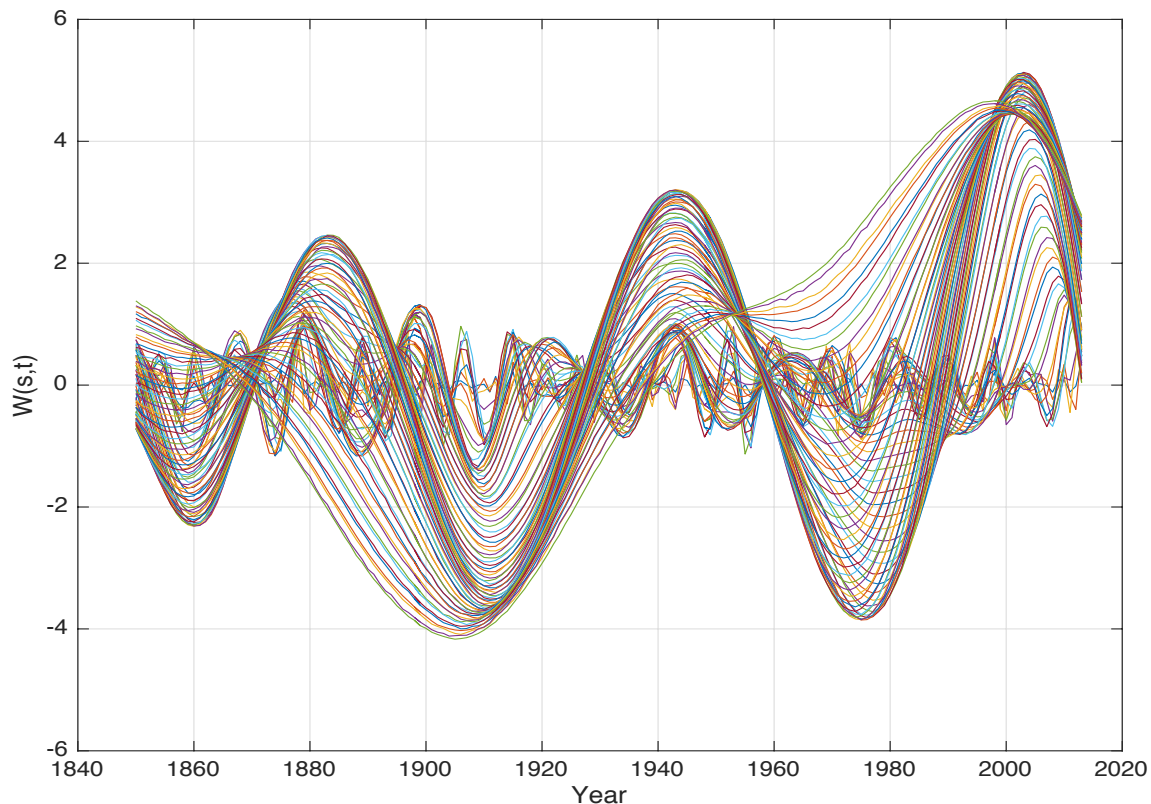
The Solar-Lunar Clock

Global Temperature Model: Solar minimum coincidence

Computed data series: 1000 - 2200 AD
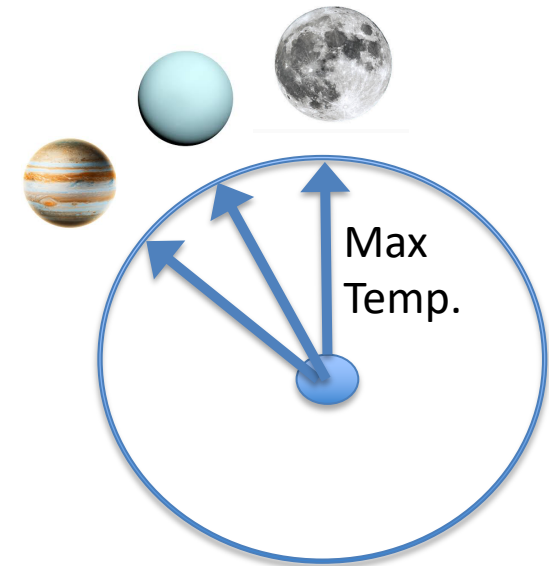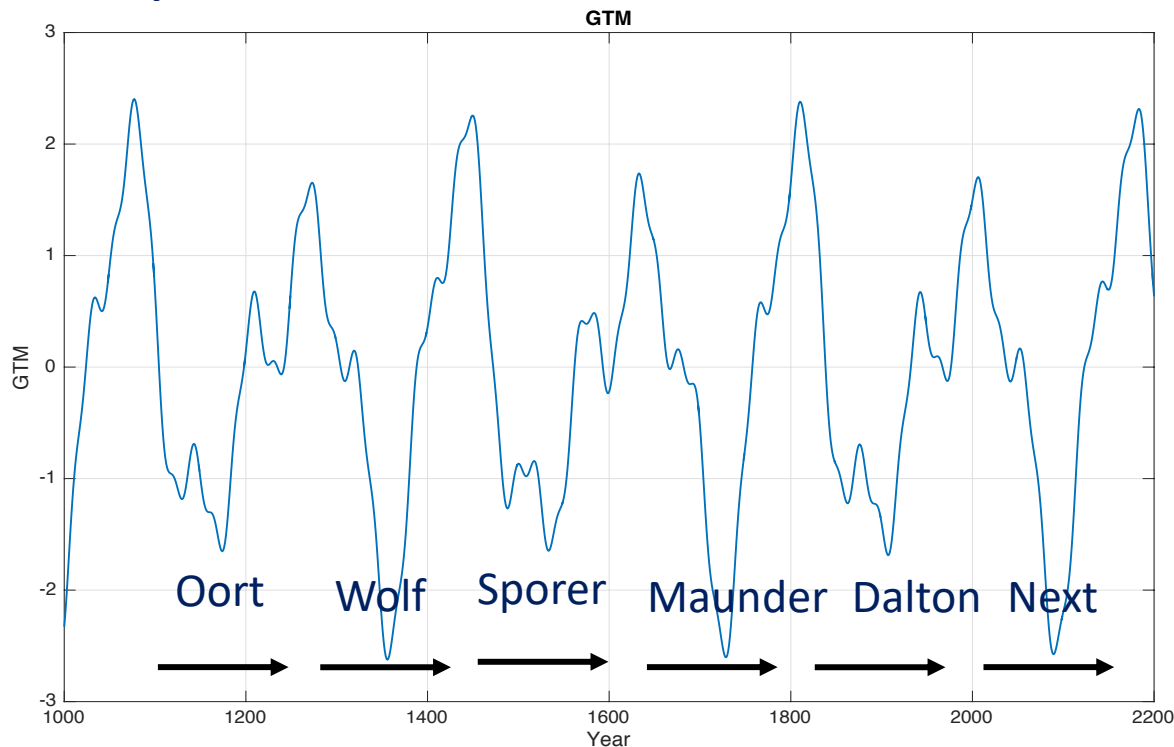
Period-phase locked to Solar-Lunar periods
Minimum temperature => Known minimum solar variability
Next deep minimum temperature: 2090 AD

Greenland Temperature (GISP2)

4000 years: 2000 BC to 2000 AD

Greenland Temperature (GISP2)

Wavelt power spectrum: 1000 A.D to 2000 A.D
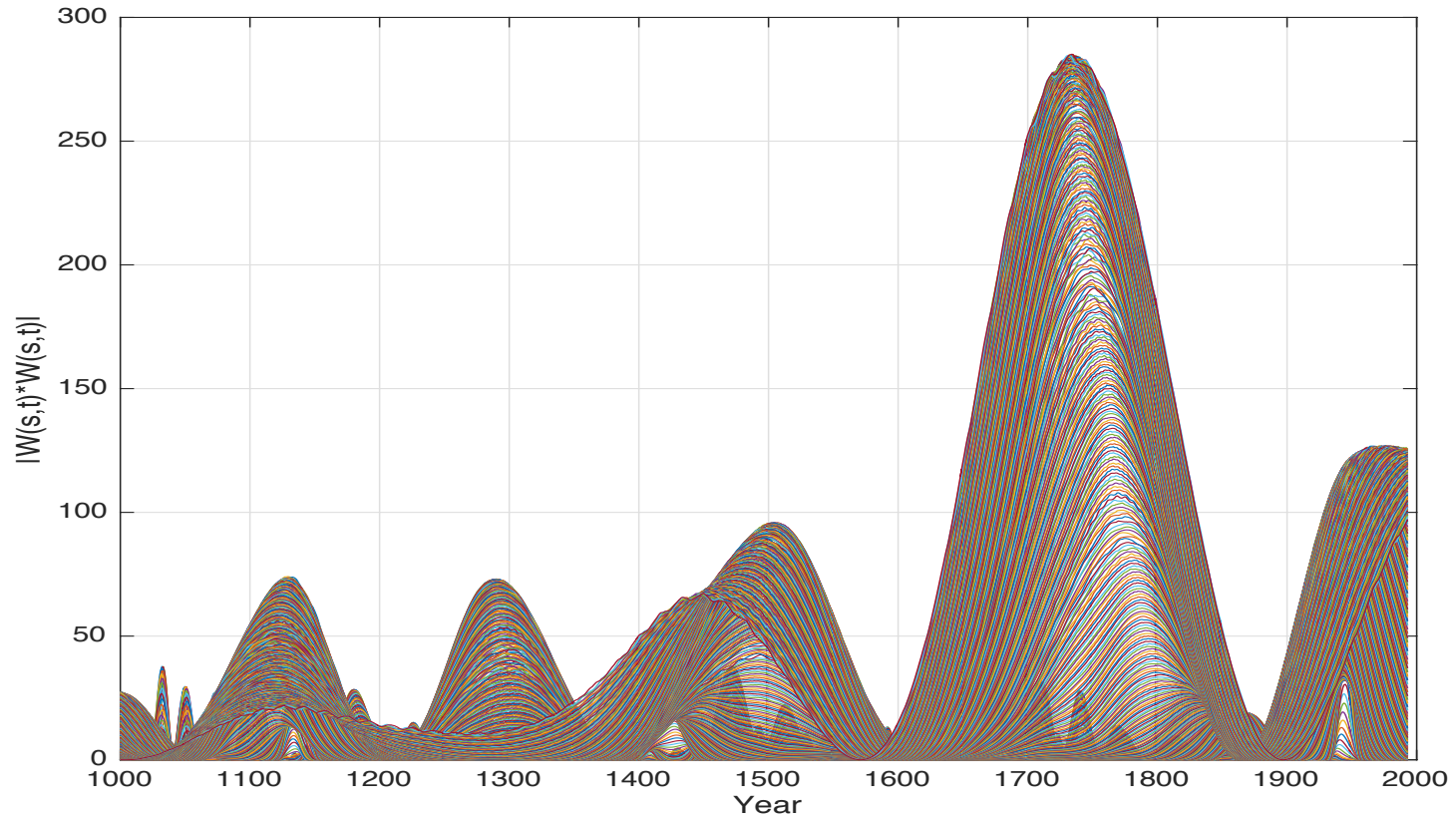
Period-Phase locked to Solar-Lunar periods
Modern warm period: 1840 – 2050 AD
Next cold period: 2050 – 2160 AD; Deep minimum: 2155 AD

Greenland Temperature (GISP2)

Wavelet power spectrum: 2000 BC to 2000 AD
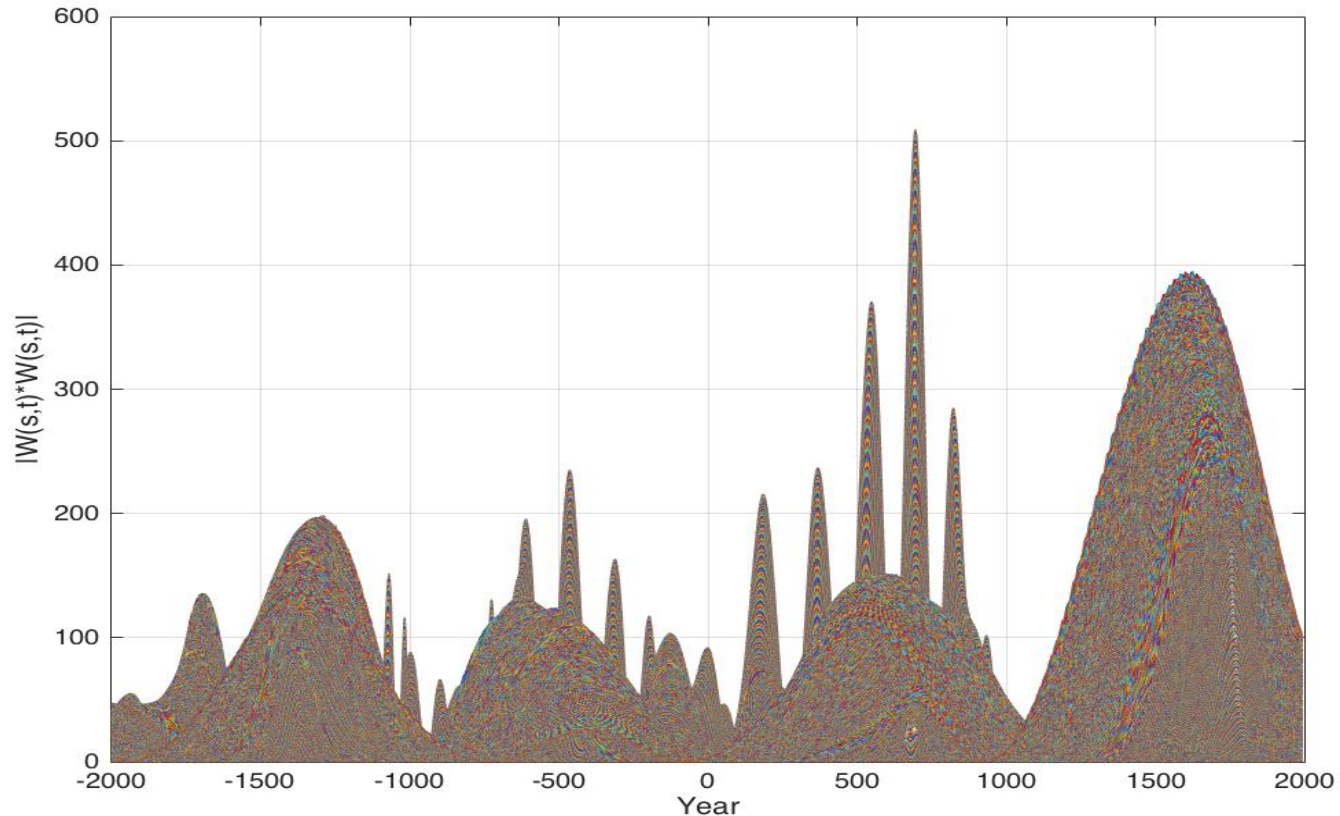
Period-phase locked to Solar-Lunar spectrum
Stationary 2046-yr period (Hallstatt-period)
Cold period: 1100 AD – 2150, Minimum: 1613

The Solar-Lunar Climate Clock

Greenland temperature: Climate shifts 2000 BC – 2000 AD

Summary

Independent data series show the same results

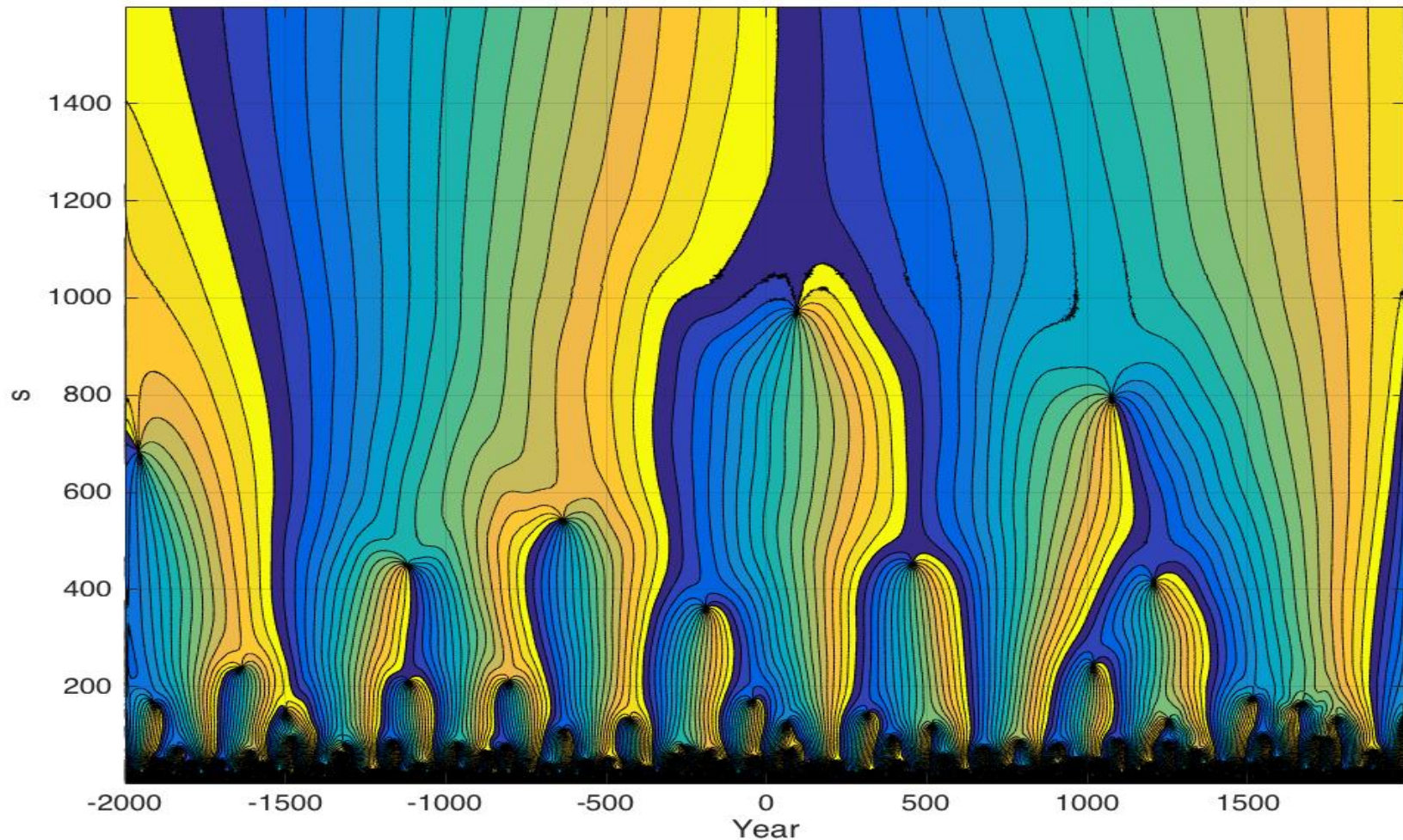|	Oort	Wolf	Spører	Maunder	Dalton	Next 1	Next 2
Solar minimum (Usoskin,)	1040	1305	1470	1680	1805		
Sunspots minimum (Yndestad, Solem, 2017)	1026	1249	1473	1696	1811	2035	
TSI-LS minimum (Yndestad, Solam, 2017)	1035	1289	1418	1672		2060	
Solar Model Minimum	1074	1249	1425	1749	1865	2060	2250
Solar-Lunar 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

WINTER IS COMING

Yndestad/2018