

Twilight of Abundance

Why making predictions is difficult

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January 21, 2017

CO₂ Disclaimer

This will be the only time that I will mention CO₂ in this presentation.

Any effects from this beneficial gas have almost nothing to do with any of the significant natural effects of solar cycles on the climate that I will be discussing here.

A brief look at David Archibald's book

- Climate, Agriculture, and Demographics are apparently on a collision course
- The key is a cooling climate in the next decades
- Demographic issues are very complicated
- The uncertainties are probably very large
- The solar key to the cooling climate is interesting – and still controversial

There will be lots of people . . .

- and maybe not enough food in the decades to come
- The economics of this issue is probably beyond the scope of this presentation
- With the Boy Scout Handbook as a guide, we have the Scout Law – 12 Steps of behavior – a key one to **be thrifty** and “do a good turn daily”
- And a concept for basic future behavior in the motto to - **be prepared**
- And the practical knowledge primer of the basic principles of scoutcraft to guide each of us

- The role of knowledge and human ingenuity
- Technology and focusing on the real problems
- The issue of preparing for a series of future catastrophes

A List

- Energy supplies in decline
- The sun - a declining output
- A cold and hungry World
- What about war – a nuclear one?
- Will we be prepared with enough food and fuel to weather the coming “storm”?

Some cases for a declining Sun

- Predictions of “the solar cycle” are still uncertain (past glacial and interglacial periods are much more certain)
- Effects from past cycles are more apparent but certainly not straightforward
- Bond cycles are clearly visible as are 60 year ocean cycles (PDO and AMO)
- There are 11 year sunspot cycles and cyclical Total Solar Irradiance (TSI) patterns
- 215 year de Vries or Suess solar cycle

Archibald focuses on the short term

- There are indications that the solar cycle 24 will be extended (perhaps 17 years long) longer than the previous two
- In fact if it is drawn out to 17 years the only other one like it occurred in the Maunder Minimum
- This predicts that during cycle 25 the climate will dramatically cool

The Theory

- The physical basis is now thought to be the solar magnetic dynamo and the pattern seems to hold across the period that the data exists
- The average is an eleven year sunspot cycle
- Other cyclical solar patterns (eg. 215 year pattern)
- Cycle 23 was almost 14 years long with declining sunspot numbers and the prediction for Cycle 24 is a longer period and less sunspots

Effects of Solar Variation

- Declining sunspot numbers indicate a less active sun
- Maunder Minimum was a historical cold period (Little Ice age)
- Willie Soon TSI shifted (10 Yr) Arctic Temp record
- Long cycle years are shown to have a following cycle that brings cold global temps
- Some research indicates 2 to 3 degrees C colder

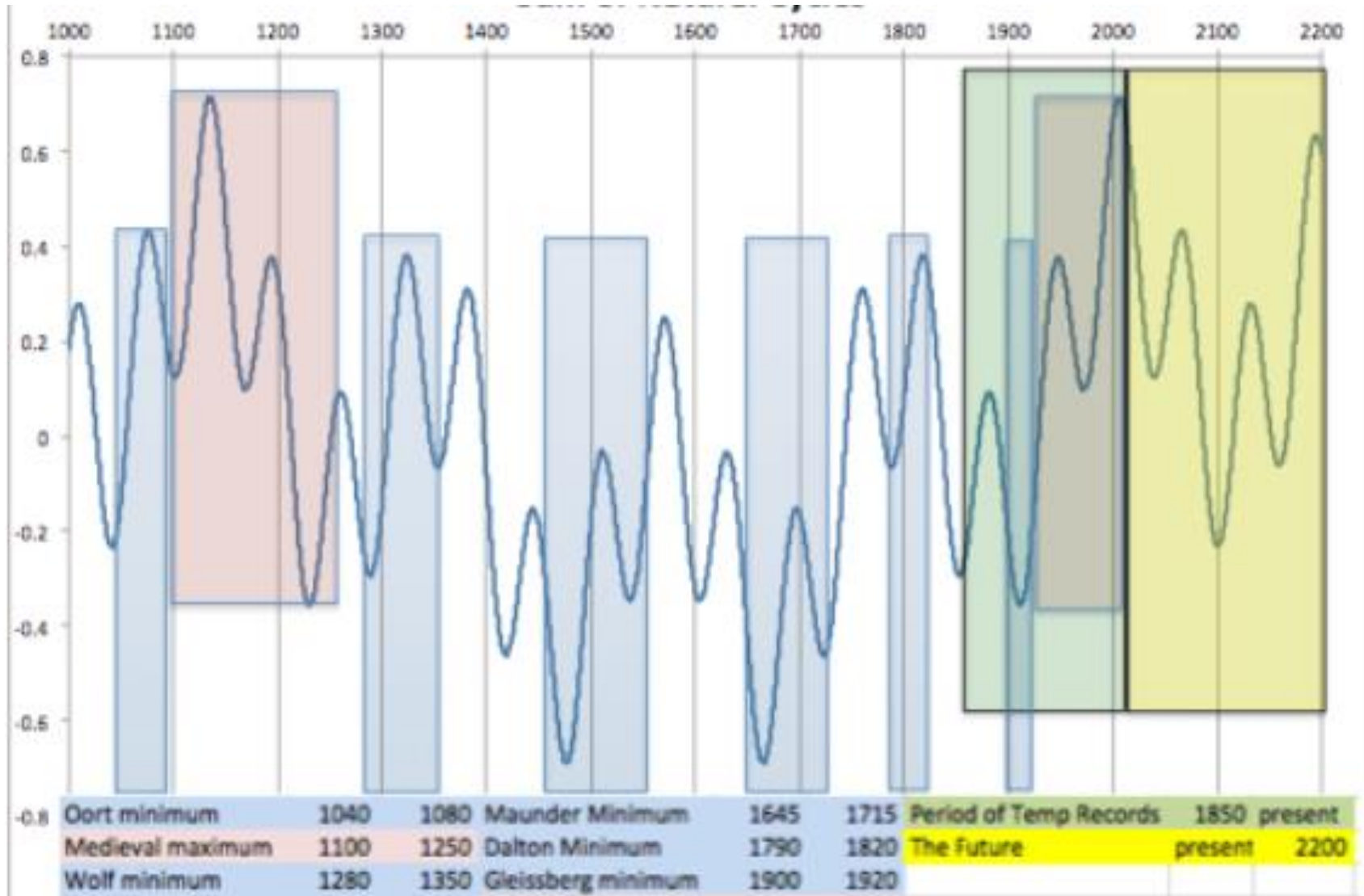
The Theory Revisited

- There are a growing number of scientists who see solar north and south magnetic pole shifts as the driver for sun spots and TSI
- A record of these shifting magnetic fields seem to correlate with the cyclical attributes of the sun and climate
- More data more data actually a longer directly measured data set is what is needed to confirm these theories

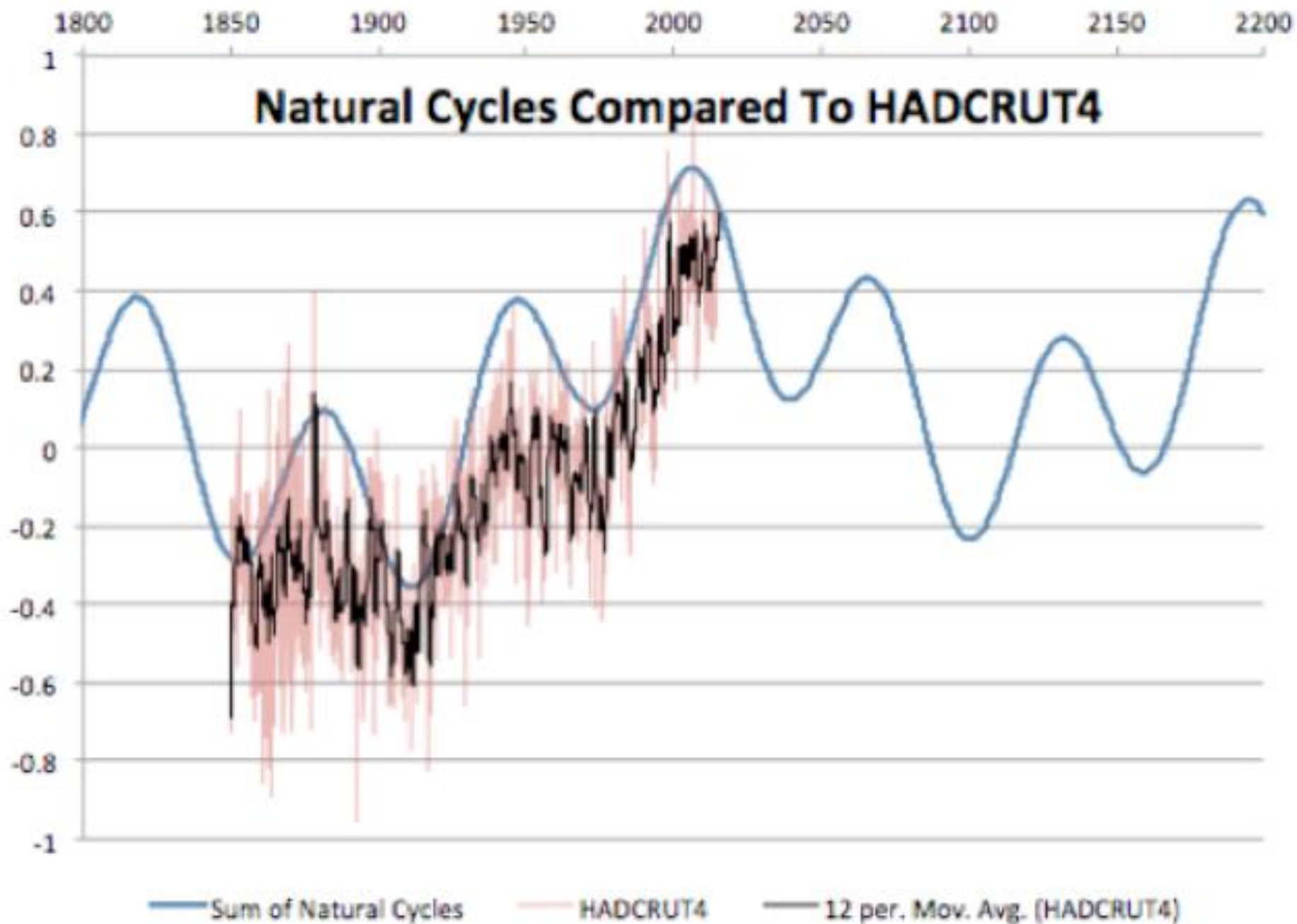
PDO now cool - AMO cooling

- With PDO and AMO both in their cooling cycles for the next several decades, this condition predicts global cooling (& drought)
- The amount of cooling is uncertain and global effects may vary but this is a separate indicator that supports the cooling theory
- Ed Caryl's model also indicates cooling and warming (around 2100 expected to be cold)

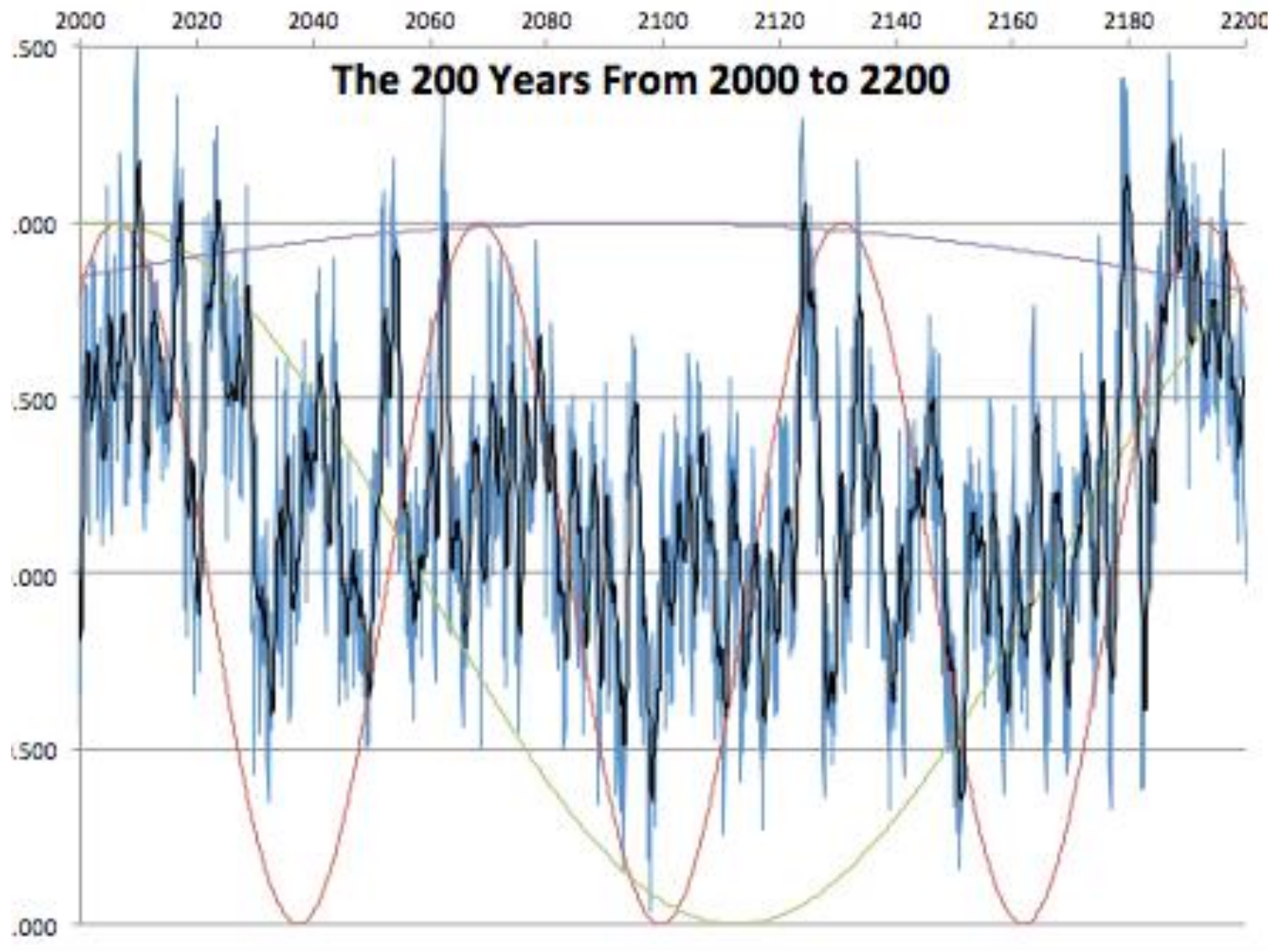
Ed Caryl Natural Cycle Model Graph



Natural Cycles Compared To HADCRUT4



The Model in Detail

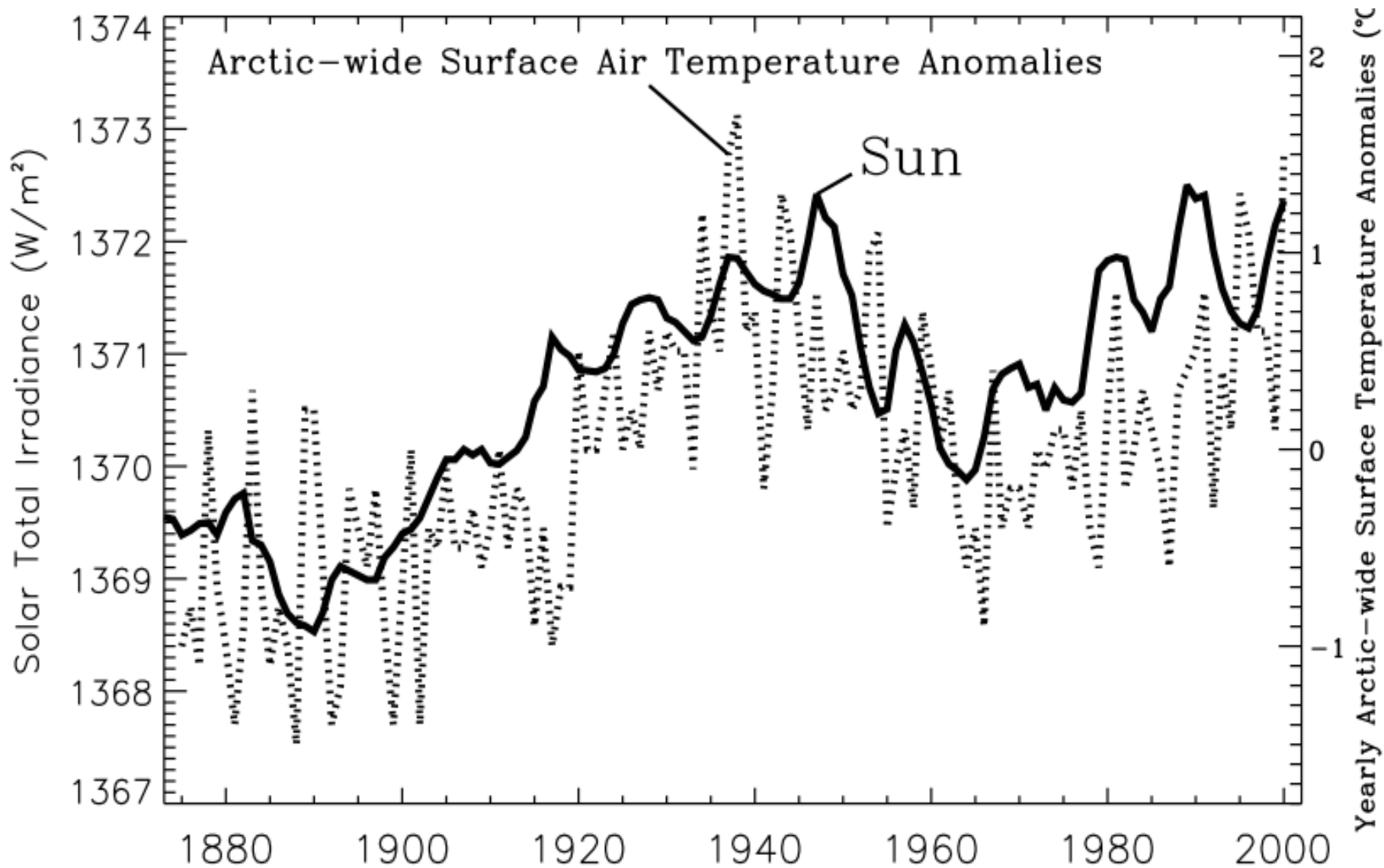


Variable solar irradiance as a plausible agent for multidecadal variations in the Arctic-wide surface air temperature record of the past 130 years

Willie W.-H. Soon

Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts, USA

Received 9 May 2005; revised 12 July 2005; accepted 29 July 2005; published 27 August 2005.



Reducing the Uncertainty

- During the next few decades we should have a better idea about these cycles and learn more about their effects on global temperature
- Past trends and geological records indicate that warming is probably not the big issue
- So what if it gets very cold for a couple of decades?

The Rest of Archibald's Story

- MENA (Middle East North Africa) and Central Africa will be ground zero for population collapse due to starvation
- Global grain supplies are expected to fall behind and not sustain already strained MENA requirements
- These crisis areas will probably continue to increase their populations in the coming decades while the rest of the world stabilizes theirs

A Snapshot of World Grain Production

- 1967 drought in India starved many but deaths were in the 1000s
- From then until now things got better with huge productivity gains in all the grains
- For those countries that spend more than 20% of their personal income on food, the situation might become marginal
- Especially if oil prices go back up in the coming decades

A Snapshot - continued

- Grain production today is about 2.4 billion tons per annum and feeds about 7 billion folks
- If food costs modify global eating habits we could probably easily feed 9 to 10 billion folks
- Archibald thinks it will feed only 8.3 billion
- If the coming cold is focused on northern hemisphere areas, Brazil and Australia might help make up some of the shortfall

Percent of Personal Expenditure on Food (2009)

- US 6.9%
 - UK 8.8%
 - Norway 12.9%
 - Japan 14.2%
 - Israel 17.2%
- This is a small sample of example countries

Marginal below this line

- Argentina 20.3%
- Russia 28%
- Egypt 38.1%
- Philippines 38.7%
- Pakistan 45.5%

Archibald's Dismal View of Fossil Fuels

(It is his view that oil production will finally peak in the next few years)

- He may be right about oil for the next century but for this century and even with peaking global population at mid century – there probably is enough oil
- Coal may also make a bit of a comeback by mid century
- There are new nuclear technologies that should emerge within a decade or two

Predicting Demographic and Economic Futures

- Though a prediction of future cooling may be likely, that is only part of the equation
- Demographic predictions are very difficult due to the variety of drivers controlling the fertility rates
- Economic factors can be quickly changed by innovations that are not even a dream right now
- The level (moderate to extreme) to which climate, population growth and economic change will reach is key to a happy versus catastrophic future

Agricultural Issues

- NAFTA caused Mexico to rely on US farms for their food and fiber needs
- Small Mexican farms quickly disappeared
- US Farm's - present tax, trade, water and subsidy policy may not have desired outcomes in the coming food crunch
- World governments need to worry and then prepare agriculturally for what may be coming by mid century (this also applies to future energy needs)
- As parts the world continue to battle and destroy energy infrastructure and crop lands, they will fall behind those parts of the world that focus on elements that assure that they have plenty of food and energy supply regardless of future catastrophic events

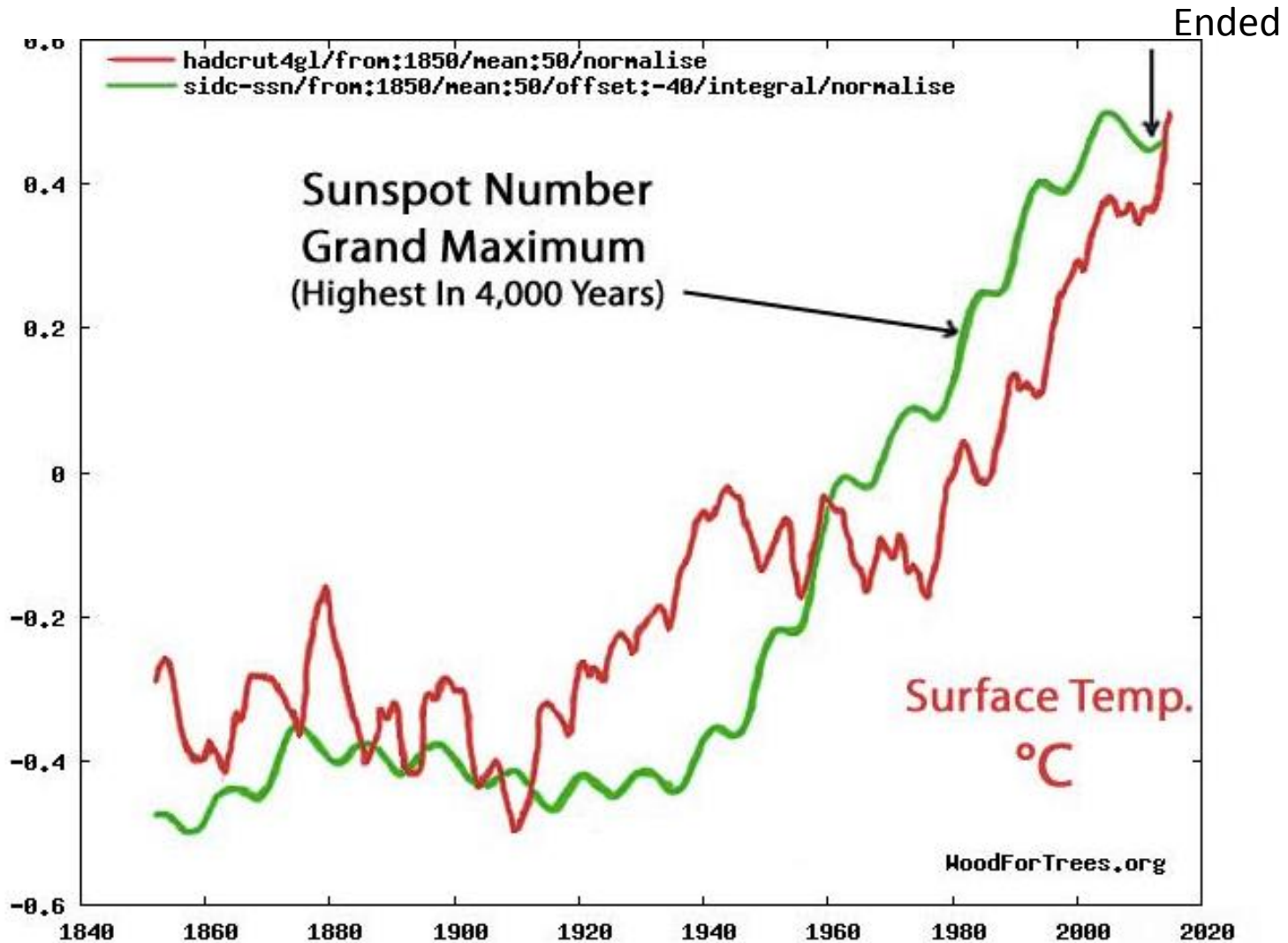
Other Critical Regions in the World

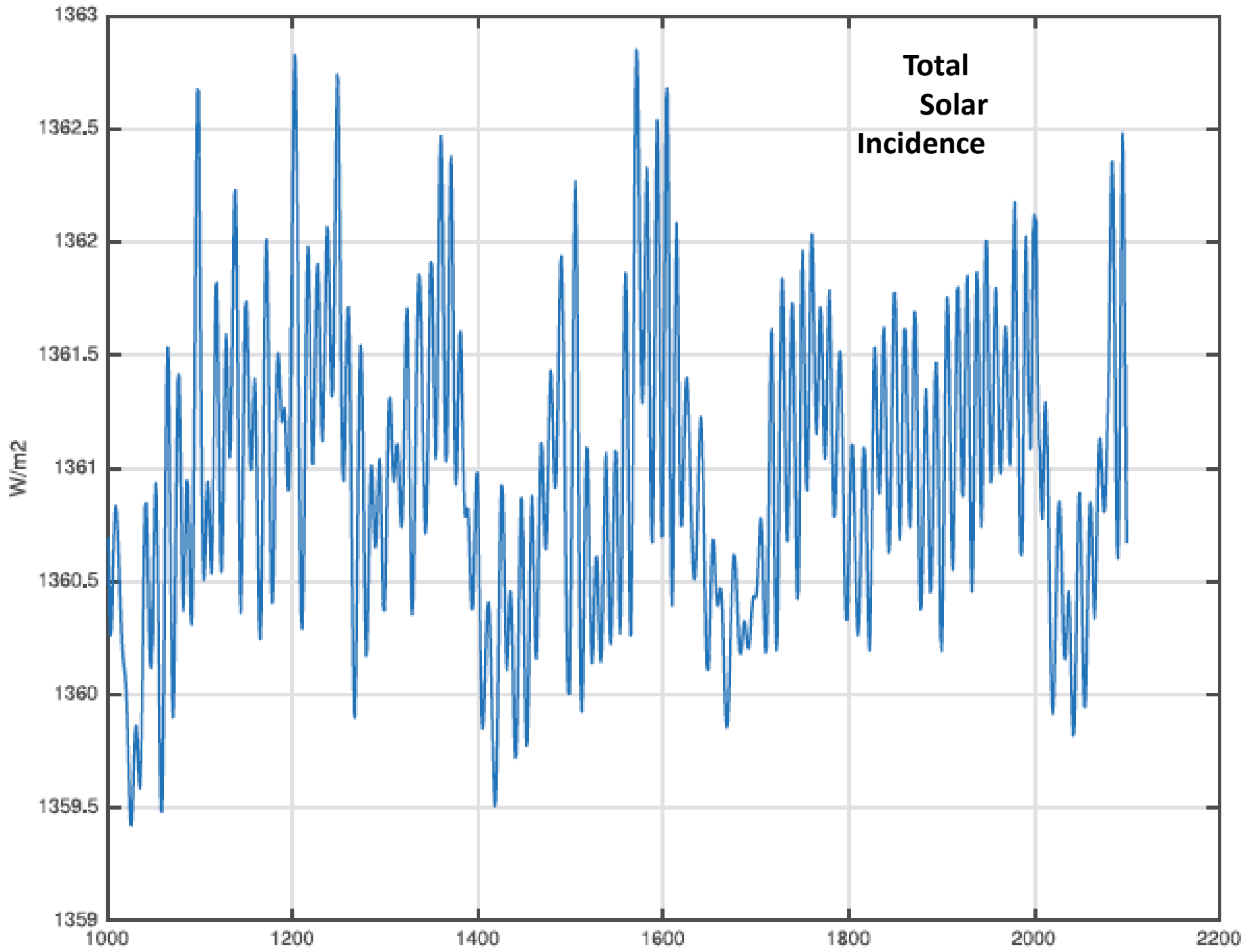
- We have already discussed MENA and Central Africa
- Some other specific elements and specific regions of the ME – ISIS, Israel, Syria, Pakistan, Iran, Iraq, Egypt and Afganistan
- China, Russia, North Korea, South America
- War (nuclear and conventional), Terror and other types of disruption
- Archibald basically writes off many of these places – ones that do not prepare and gather their resources for possible mass starvation

My Opinion

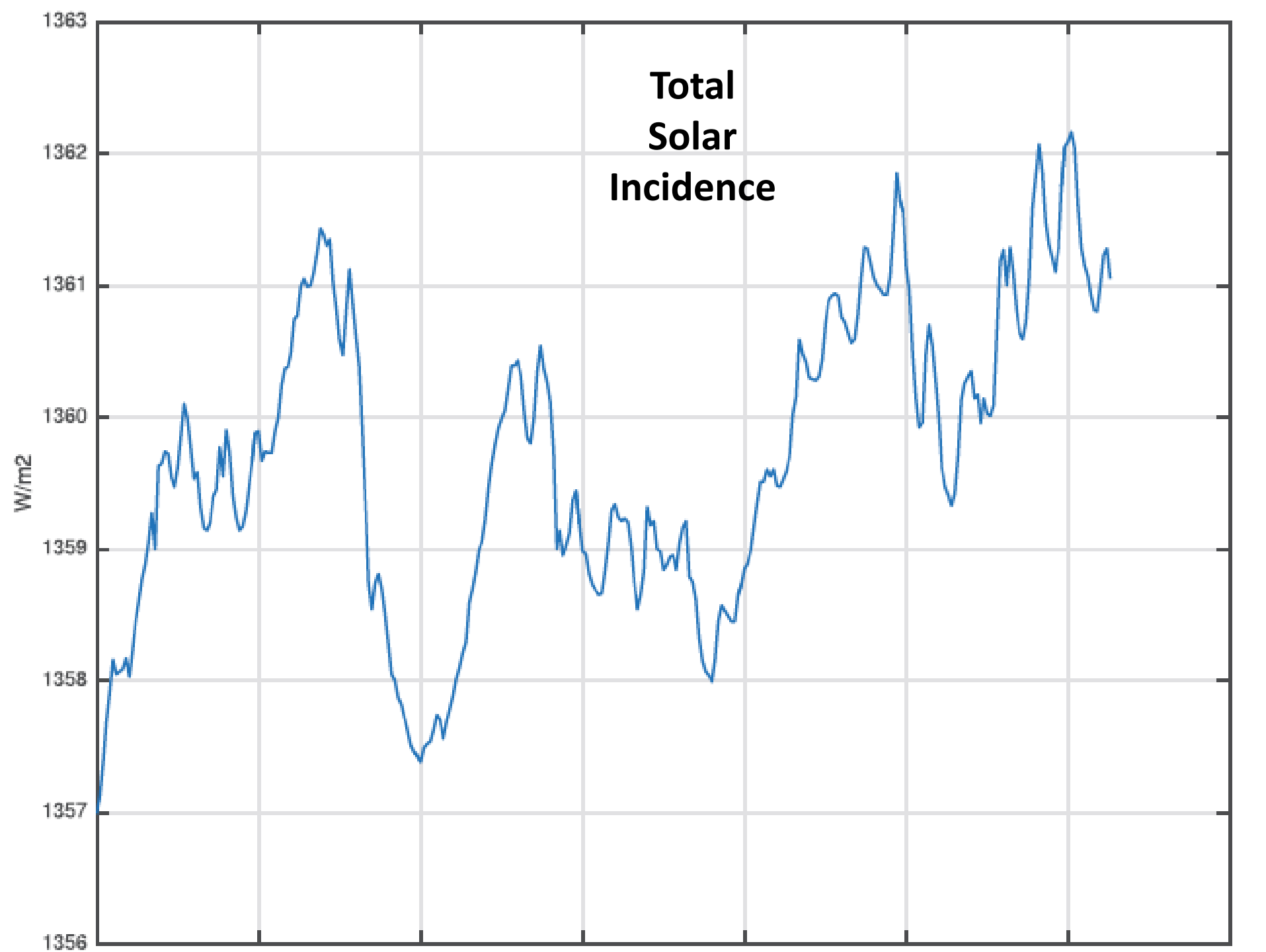
- Archibald's view is only one possibility
- There are so many variables that these worst case scenarios are likely to be at the extreme
- I do not believe that the pause or an open loop warming trend is the only possibility either
- What we always see of temperature, rainfall and other climate indicators is a cyclical pattern (warming – cooling – warming etc)
- These cycles are generally bounded with much lower bounds during deep glacial periods (and much higher bounds during interglacial periods)

Last Look at Climate and the Sun





Total Solar Incidence



Conclusion

- Should we expect some cooling in the near future? Yes it seems likely
- We might even be at the peak of a long term “Grand Maximum” and for now USCRN is in a down trend.
- Could it be dramatically cooler? It is very possible based on past cycles and we have experienced a large El Nino much like the 1941 El Nino that was followed by a steep and deep La Nina
- Nino 3.4 temps are at the low neutral point ready to head into La Nina territory. What will they do?

Last but not least

- Have we reached some sort of upper warming limit for the time being? It seems to be likely due to past bounding limits.
- Is this my guarded prediction? Yes I would bet on it.
- Ask about all this in a decade or two. It might be a real laugh at a time when I have gotten old and cranky.

“The long sunspot cycle 23 predicts a significant temperature decrease in cycle 24”

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Ole Humlum Department of Geosciences, University of Oslo,
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“The influence of solar system oscillation on the variability of the total solar irradiance”

Harald Yndestad a, Jan-Erik Solheim b

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Orbit of the solar center with respect to the Solar System Barycenter results due to gravitational effects of the 4 large planets – Jupiter, Saturn, Uranus and Neptune

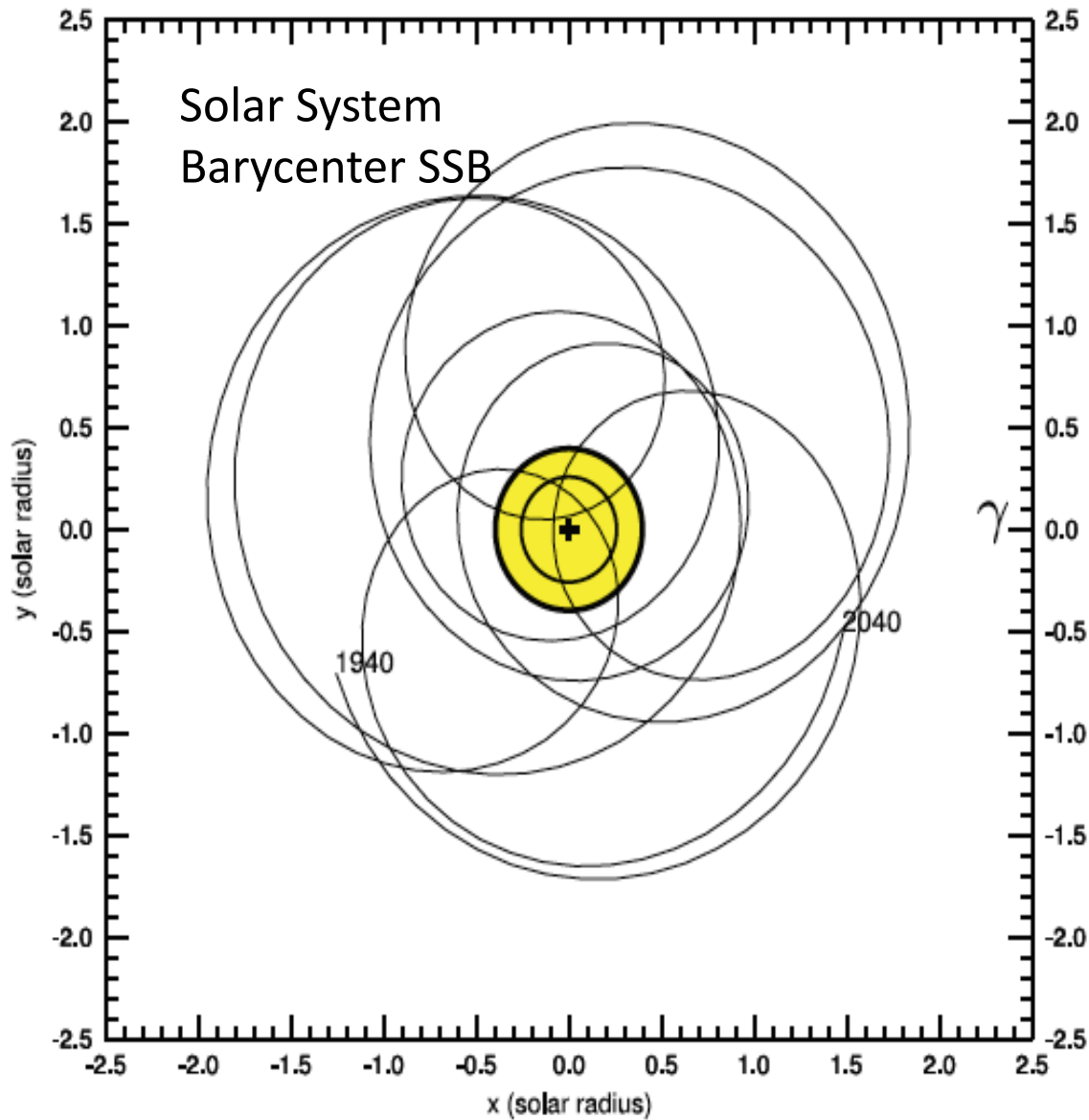


Fig. 1. Orbit of the solar center with respect to the solar system barycenter (SSB) (+) for the period 1940–2040 in the ecliptic plane defined in the direction of the Earth's vernal equinox (γ). The outer yellow circle represents the diameter of the Sun, and the inner circle with radius $0.65r_{\odot}$ represents a shell where the potential energy (PE) of the solar radiative zone can be affected if the solar center moves closer to the SSB (Cionco and Soon, 2015). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)