

Howell's review of:
Yaskell & Yaeger - Mechanism for Grand Solar Minimum, Chapter
4

Due 14Sep2011

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4. Grand solar episodes in civilization-altering contexts

For considering this, a return is made to points taken up in earlier chapters on Nature and civilization, that the course of history -

~~humanity upon, any solar episodic impact (for the weaker or stronger, grand or "normal")~~
Academically can be taken in two important and usual ways: idealized as being driven by:

- ~~something as~~ Natural disasters and changes in the environment ~~e impresses upon the human race~~ (Nature determines the total course). ~~Or:~~
- ~~it can seen as something humans are always either immune or fated to, and humans ply their own total course, regardless of Nature, usually in thanks to~~ Human initiative – for example, great leaders, or political systems, or both:

The former is classical environmental determinism. The latter is pure Plato.

[Howell – see “broadening comments” on theories/ views of history and its drivers]

With respect to solar episodic impacts (for the weaker or stronger, grand or “normal”) - (and non, as opposed to anti, academic) So the position taken in this book will consist of neither ~~extreme~~ the analysis and view will be, rather, an inclusioning mate of the two simple lines of thinking, natural and human centric, augmented by a broader perspective. No claim is made to some kind of modality or modulus compelling human behavior or temperaments into one mode or another, determined by a set geographical locations or even a set form of what could be called regular climate or socio-political conditions, laws, or wise rulers. As we understood in the contemplation and comprehension of deep time in Chapter 1, we knew Nature to be a constant constraint as well as a willing assistant to society and its individual and collective behavior. We saw that humanity adapts and tries to overcome or at to least assimilate climatic severity of any kind. In fact, humans perhaps thrive on just such a challenge and use various natural conditions as pretexts for exploration and colonization as much as they would socio-political/religious ones.

To approach this subject, we look at the entire Holocene Epoch in this chapter, starting from the end of the deep ice age of over 11,700 B.P. but more closely from c. 8,000 years ago. then closer still from c. 1,600 years ago to the present. Various factors will be looked at from the data of 1,600 to now: the tendency toward cultivation and the enhancement of this, the classic 7 “plagues” (plagues/epidemics drought, flood, fire, insect (eg locust) swarms, crop and human disease, and war; ignoring for now the 3 BIG “mythical” plagues – earth upheavals, prolonged darkness/extreme winds, thunderbolts and rock showers) and their lengths. [Howell link to Yaskell's similar original comments later on on “solar hibernations”] , and warfare – ??As a proxy for warfare, we start with?? this latter, extrapolated ~~from the~~ historical data on historical

grounds, taken at for the beginnings and ends of various empires, dynasties, republics, regimes, archaeological horizons, and so on. [Howell – I have to check the lists of the 7 and 10 plagues – biblical should be easy. The issue is that it seems they also tend to be temporally associated, though I haven't really checked this... they certainly are in the Bible – I'm absolutely not religious, but I now have far more respect for the historical veracity of the bible than all but a handful of historians and scientists...]

Proxies for sun, astronomy, and climate

[Howell suggestion - perhaps this is best placed in an Appendix. My guess is that this may already be addressed elsewhere in your book:

In looking at how solar or astronomical factors have influenced climate and civilisations at different timescales and within different regions, we must use “proxies” (substitutes) for solar activity, as we do not have consistent, quality, unambiguous data on historical timescales. A very few of the large number of sources of proxy information sources are described below:

- Direct solar irradiance measurements - High quality F10.7 solar irradiance measurements from Penticton, BC for only 50 years. More modern measurements include the full spectrum, and are available from satellites without the interfering effects of the atmosphere.
- Sunspot cycles (Scwabe/Hale (11/22 year) - Sunspots can be used as a general indication of solar activity, although you should be aware that the fit is approximate, and difference components of the irradiance have slightly different timing. Good sunspot data goes back to the mid-1800's, and reasonable observations to ~1600 at the time of Galileo. There are sporadic observations by the Chinese back as far as ?~0? AD.
- Radio-isotopes (C14, Be10) - Prior to 1600, a typical approach is to use carbon 14 (C14) and beryllium 10 (Be10) isotope measurements as proxies for solar activity. These easily cover the Holocene period (eg certainly back to 10 ky Before Present (BP) for C14). However, C14 and Be10 levels are strongly affected by other factors such as galactic / cosmic rays, supposedly by anthropogenic burning of fossil fuels, and possibly by other processes. Note that as a very important hypothesis from perhaps the ?1950s?, and established solidly by Svensmark and team (references – eg Chilling Stars) cosmic rays have a strong influence, perhaps dominant among most factors at scales less than 200 years, on cloud cover. Cloud cover, in turn, is hugely important for climate. For the past ?15? years or so, Svensmark and team have shown impressive correlations that appear to surpass conventional hypothesis.
- Glacial ice-rafting events - Another indicator that is taken as a proxy for climate are the deposits of glacial ?till? In marine sediments, presumably carried over the seas by icebergs, which are much more frequent during cold periods. These so-called ?Haansgaard-Oscberger? ice rafting events are described below, and show a ~1,500 year Bond cycle.
- Glacial ice-core data - have been extensively used for studying the last period of glaciation and for the last 400-750 ky of multiple glaciations. It seems to me that they should also be useful for the period of civilisation, but unfortunately their credibility for this purpose has

been damaged by manipulations to flatten temperature series for the last 2,000 years, while introducing a fantastic “hockey stick” inflection in the last 150 years. Better to stay away from this until the scientific rot and trash is cleaned up, perhaps in 20 years, or get the raw data from non-UN-IPCC enthusiasts and do the analysis yourself. <grin>

- Marine sediments - are typically seen in longer-term times studies for millions to billions of years , but there is fine-grained information available for the period of civilisation. Papers by Tim Patterson's team for Effingen Inlet on Vancouver Island are a great example.
- Stalagmites and stalagmites - are not usually thought of for short periods like the last 7.5 ky, but as with ice core data there is information there. [Howell – comments later...]

As “proxies”, these measures should NOT be taken as pure indications of solar activity! All of these data sources, plus many others, can be used to extract information on climate cycles. Typically this has been done through Fourier analysis, as the resultant “power spectra” provide “fingerprints” that greatly help to understand and compare complex time series. From this arises the statement that various “cycles” exist in climate. Unfortunately, far too often scientists and the users of scientific results mis-understand the nature of these “cycles”, perhaps keeping the high-school notion of sinusoidal curves in their minds. But natural cycles aren't like sinusoids! They are better described as “quasi-cycles” for which the amplitude, period, and waveform doesn't repeat. Even astronomical cycles, usually taken as perfect, are like this at the extremes of accuracy. Keep in mind that many climate effects are probably third or fourth order, so “tiny squiggles” are important! This has been a constant mistake of scientists in the case of solar irradiance, which has perennially been classed as “too small a variation to account for the temperature variability observed”. This vast consensus should be enshrined as a warnign to future generations of scientists.

As a further point, please keep in mind that while Fourier series analysis is still a useful tool, it does not have anywhere close to the capabilities of advanced wavelet transform analysis, and is probably inadequate for many, if not most, climate systems. For an example, see Tim Patterson's analysis for Effingen Inlet fish populations, and Willie Soon's analysis of the Arctic Oscillation (wind-ocean oscillation).

Models linking sun, astronomy, and climate

At this point, it's important to state that to my knowledge the ONLY “predictive” relation for short-to-mid-term (1.8 to 2,402.2 years) climate “quasi-cycles” is that of Ivanka Charvatova (I believe this has been reproduced by others). I say that in the sense that most of the major climate periodicities from >1 year to 2,400 years arise directly from Charvatova's sun-barycenter model, but also in terms of the apparent predictability of the sunspot cycles with Cahrvatova's model – which no-one else seems to have!

-[Howell suggestion for inclusion – see “Charvaotva's link between Solar Inertial Motion (SIM) and Climate”]

See figure below

Note that there seems to be a great predictability of “corresponding” sunspot cycles using Charvatova's approach, but there are too few sunspot cycles since 1730 to really test. {howell – I have done this for a couple of sunspot cycles!}

Note that the beloved General Circulation Models (GCMs) or “Global Climate Models” as they are sometimes referred to, not only have always failed even for periods of only 5 years prediction, but have basically NO predictive capability for quasi-cycles nor climate. In other words, like many numerical models, complex systems behaviour isn't “emergent”, instead it is observed then back-integrated into models, often with simple factors. Unfortunately, the GCM models dominate modern scientists thinking. Hopefully they will be rebuilt or better yet thrown away soon, leaving that approach to future scientists who can work free of today's peculiar environment in science.

Charvatovan periods	Charvatova		Bucha et al	Niroma	
	Motion- based	Temperature – based			
Charvatovan short – VE (absolute)	1.6	n/a			
JN/2 – Jupiter-Neptune	6.5	6.5	6.4		
JU/2 – Jupiter-Uranus			6.9		
Charvatovan (sun-barycenter)	7.8	7.8	7.8		
Charvatovan (sun-barycenter)	8.4	8.4-8.5			
Charvatovan (sun-barycenter)	7.4	7.3-7.4		9.3	
JS/2 Jupiter-Saturn			9.9	9.9	
Charvatovan (sun-barycenter)	10.4	10.3-10.5		10.3	
Jupiter	11.9		11.9	11.9	
Charvatovan (sun-barycenter)	12.0	n/a		11.1	Schwabe half cycle of sunspots
JN - Jupiter-Neptune	12.8	12.8	12.8	12.7	
JU - Jupiter-Uranus	13.8	n/a	13.8		
Jupiter-Saturn			19.9		
Saturn			29.0		
SN - Saturn-Neptune			35.0		
SU - Saturn-Uranus			45.0		
Charvatovan trefoils	50-60	n/a	60.0		
Uranus			84.0		
Charvatova – SIM basic period	178	150-200			~Gleissberg quasi-cycle 70-90 y
		850-950			~Suess quasi-cycle
		1000-1200			~"great inequality" of the motion of Jupiter
		1500			~Bond quasi-cycle
Charvatovan (sun-barycenter)	2200	2280			
Charvatovan long period –	2402.2	2000-2400			

I. Charvatova 1988 "The relations between solar motion and solar variability" Bulletin Astronomical Institute of Czechoslovakia v41 (1990) pp56-59

Ivanka Charvátová, Jaroslav Strestik 2004 "Periodicities between 6 and 16 years in surface air temperature in possible relation to solar inertial motion" Journal of Atmospheric and Solar-Terrestrial Physics 66 (2004) pp219-227

Bucha, V., Jakubcov+a, I, Pick, M., 1985. Resonance frequencies in the Sun's motion. Studia Geophysica et Geodetica 29, 107–111.

Niroma – must fund reference..

~~One approach~~In one case, overlaid on this view is ~~the that of to show pseudo-decadal~~ ~~pseudo-decadal~~ averaging of global solar insolation over this entire period ~~globally~~, and ~~tie~~ compare it to ~~human civilization the rises~~ and falls of civilisations (for want of a better phrase, and with apologies to Edward Gibbon). _

~~civilisations~~versus C14 & Be10 With respect to one chart of

~~These visual approaches lack the statistical power of)~~. Although this is inferior to filtering via ~~sliding window~~ the statistics used are simple (– advanced wavelet transform analysis (or even the largely out-moded Fourier power spectra analysis when applied to non-stationary, spatio-temporal

~~analysis like climate).; But a simple graphical comparison of filtered data is fast and lets one provides a detailed "look" at data, which is superior in a sense to statistical treatment. This is especially so when considering how often data pretreatment is inveigled; that is, thereby reducing the "coloring and destruction" of the information that often results from statistical methods (especially when mis-applied!).~~ Then there are the very often poorly-understood limitations and constraints of the statistical tools that are commonly used to create such structures.

This “grand” sweeping view, if you will, covers many purported solar minima and maxima over the “normal” paths of solar activity, to include the focused subjects of the Medieval Maximum, the Maunder Minimum and the Little Ice Age. The idea is to connect this to the deeper ice age that preceded the Holocene to the more modern and better documented occurrences of a grand episodic nature.

[Howell – wording in the last paragraph is a bit uncertain...? what is “normal”? What do you mean by “over the normal”?]

[Howell – See comments on “The full timescale – seconds to the age of the Earth” for climate, solar activity, galactic rays,]

The end of the deep ice age: the late Pleistocene to the Holocene’s start in the Quaternary Period

[Howell – see “broadening comments” on glaciations models (I have several graphs over 6 My)]

What kind of world was it before the Holocene, before or right at the end of the last deep ice age? Why take such a stepped-back view from the length of the Holocene, which is a little more than ten thousand years in duration? This view is long in one sense and short in another.

Figure 1. Ice rafting events from ocean sediment core samples, showing positive and negative relationships between the 18O and 16O isotope. (After Bond, G, 1999)



Mainly, this is done to lend perspective to the coming graphs showing the total (pseudo-decadally averaged) solar insolation as superimposed over human civilization for the last 9,000 years. This view from the start of the Holocene lends greater depth to deep time visually, brought to the present, as we lead up to the most recent grand solar episodes and the mysterious LIA; the LIA becoming dwarfed in this grand view. This view, from glacial ice rafting events from that time, also introduces temperature isotopes that are vital for understanding climate change: Oxygen 16 and 18 (O18 and O16).

Figure 1 is based on Gerard Bond’s research on hematite stains, moving glacial points, and a tie to solar activity. It covers c. 90,000 years for at least four full Earth precessional ¹ periods

1 Earth’s axial tilt, which gives us new pole-star orientations every c. 20,000 years.

leading up to the Holocene, when the Earth was in a deep ice age. But even in that deep ice age, there were at least 25 rapid climate fluctuations peaking the amplitude of climate on Earth upward. That is, there were warming peaks/ even in much colder, deep ice age times. [\[Howell question broadening - on Bond pseudo-cycles \(sometimes I say quasi-cycles\)\]](#)

“Up and down” wave amplitudes are shown by small hematite rock grains (in Figure 1’s case) [found in deep sea core samples](#) off the Northeast U.S. and Canadian coasts. Climate change is recorded well on [the Laurentian shield off the coast at these latitudes](#). [The hematite was found like this: ice-rafted debris in ocean core samples came from melted icebergs that were broken off the tongues of glaciers](#) These icebergs contained the small stones (rock grains) that fell to the ocean floor (becoming part of the sediment and so, taken up by researchers in core samples) [as a consequence of icebergs melting on their way south](#). Thus collected in ocean sediment cores, they were then isotopically [dated](#). Delta counts of the Oxygen-18 isotope in the core samples, compared to the hematite *stain* grains, reveals [a c. 1,500 \(+/- 500\) year hop](#). These would be, then, the recurring rapid climate fluctuations (25 or so) just mentioned, and these are highly debated as to their cause and prevalence. [\[Howell – the edits above seem to have left several “fractured” sentences”. Another key points is that natural “cycles” should be called psuedo-cycles – the period, amplitude, and waveform vary a lot! Failing to properly consider this has prompted many dumb comments from many if not most scientists.\]](#)

The “hop” is the *temperature change* recorded by comparing the TWO proxy isotopes of TEMPERATURE. These two are Oxygen-18 and Oxygen-16. Then in this comparison, researchers obtain (like in Carbon-14, for TIME or PERIOD) a deep Earth date, from a ratio, off a chart. If the ratio of 18O to 16O is HIGHER it was COLDER then. If the ratio of 18O to 16O is LOWER it was WARMER then. (In Figure 1, these warm amplitude peaks are plotted upward.)

In this theory, within a 90,000 year period, there seems to be a warming rise recorded by these two isotopes regardless of whether or not we are in a deep ice age. [\[Howell comment only – excellent and VERY important comment in general for natural systems. Often we get an impression of smooth monotonic changes over time because of filtered views – for example the sunspot cycle. But the actual data often bears NO resemblance to this!\]](#) The graph shows at least twenty of these “Bond events” prior to the deep ice age ending 11,700 years B.P. (dark blue arrow) and that a steady rise in temperature hemispherically occurred rather quickly thereafter. It is a “whole new plateau,” so to speak, in globally averaged temperatures, as weak a proxy as Delta T measurement is. It must have risen, since the temperature isotope’s ratio roughly today is -34 O16-O18, and at the end of the deep ice age, it was -40 (higher, in other words, and so, colder). Figure 1 does indeed reflect this. The very last of the ice age fauna like Woolly Mammoth were on their way out. Neanderthal, our human cousin and possibly chief architect of survival in the cold of the deep ice age was long gone. We (Cro Magnon) had by this time long learned to read the shifting climates and was the sole surviving human type. As human-ape animals we are hardly any longer the hot-weather type from which we evolved in the high

tropical periods three million years or more ago in equatorial Africa, and back when England was like the ~~Philippines~~. It lends much accuracy to Steven M. Stanley's aptly-titled book, "Children of the Ice Age."

The red arrow in Figure 1 shows the current upward trend in temperature according to these isotopes. The lower dip inside of this high rise (the light blue arrow) shows the end of the last cooler trend about the year 1880. Visually it is a small distance and indeed, in deep time, it is just a short distance. But near ancestors report down to us from this time how noticeably snowier and colder; windier, rainier, and wetter it was just a hundred to 130 years ago.

Eleven thousand years ago modern humans (Cro Magnon) had been around for c.40,000 years. His cousin the Neanderthal, still in existence at Cro Magnon's beginning, may have taught them (who are essentially us) how to master the cold. The ice fields and sheets started to recede in the U.S. Northeast (close to the Laurentian if not a part of it) to name one well known location. It took a few thousand years for it to repopulate with fauna and flora remotely familiar to what we see around us today. In fact it is still quite hilly and rock-till filled, with eskers and terminal and lateral moraines barely covered over with vegetation even in the summer, as any hiker in the northeastern U.S., for instance, can see. Predictably as one reaches Canada the till is less common and the moraines, eskers, etc more visible and in many cases higher. As shown in the top part of Figure 1, the amplitudes of the Holocene are very small and tightly knitted compared to those in the deeper part of the deep ice age. Still they show their up and down variations for the cooler and the warmer, us currently being in the warmer. The current "down" part of the 18O-16O ratio (and higher wave peak) means the water and air over us are, roughly speaking, warmer since 1880. In the vast scheme of things, that timeframe was cold; but not *that* cold in the Northern Hemisphere, compared to now:

[Howell – see useless titbit - "vegetative following of the ice sheets"]

In the close up of Figure 1 (in Figure 2) we get a glimpse at the last 9,000 years of the Holocene and its tightly knit, up and down peaks of cold and warm periods. Before 10,000 years ago, the warmest interstadials were far from the coolest ones in the Holocene, a few exceptions aside. The Holocene is indeed a whole new plateau of climate behavior [Howell – possible insertion, albeit distracting - when compared with the recent interglacial period, although it is not as warm as several previous interglacial periods. Ominously, the current interglacial is looking rather long when compared to previous interglacials of similar "warmth", which has prompted several scientists over the years to suggest we are nearing the end of this one, with the Little Ice Age (LIA) being a harbinger.]

Around 3,000 years after the deep ice age's end there was a significant cooling period called the "8.2 kiloyear event," or, 8,200 years before present (or 6200 BC). In Figure 2, the downward peaks are such that the 8.2 Kyr event is nearly as far downward as the Little Ice Age (LIA). For the 8.2 Kyr event's occurrence we look at oscillations in the ocean current system. An abrupt cold period occurred around 8,200 BP in the North Atlantic area. It lasted for about 300 years. In Greenland ice-core records it is characterized by a reduction in temperature greater than 1°C, a decrease in ice accumulation rate, increasing wind speeds, and a drop in atmospheric methane

levels.² A slowing down of the thermohaline circulation as a result of a freshwater perturbation has been proposed as the cause of the event. The thermohaline circulation slowdown resulted in a decrease of the northward heat transport in the North Atlantic Ocean, leading to pronounced cooling. The proglacial Laurentide Lakes in front of the Laurentide ice sheet were most probably the source of the freshwater surge into the salt sea.³ So it seems as if melting ice caused a negative climate feedback in ocean circulation, resulting in Northern Hemispheric cooling for three centuries.

[Howell comment to ignore - I'm not a huge fan of the thermohaline hypothesis, although I am not familiar with the modelling details and I haven't worked with it. It's just a suspicion... and a lack seeing of what I would consider solid and convincing comments. A similar concept was "deep-ocean CO2 circulation & release, the version of which I looked at was either fantasia or hallucinogenic drugs or both. Still, it's plausible and good to keep in mind.]

Figure 2. Close up of Figure 1, showing the 8.2 Kyr event in relation to the Little Ice Age (LIA).

A thousand years after the 8.2 Kyr event, or so Figure 2 intimates (and the pseudo-decadal graphs below shows) the Holocene Maximum (or, Climate Optimum) occurred. *[Howell important terminology to check! - Is the 8.5 ky event the "Younger Dryas"? Which I thought was a cold dry event 6 ky ago, although maybe it was 6 ky BC ~ 8.5 ky BP. It's extremely important for you to see if that is the case. In either case, you must mention the Younger Dryas – probably more people know that term than Holocene Climate Optimum.]* Upper state New York, the archaeologist William Ritchey⁴ reported C14 dating marked the area *[Howell, seems mistaken – C14 is typically taken as age marker, delta [O18/16 or deuterium] as temperature]*

2

Wiersma A.P. & Renssen H., "Model-data comparison for the 8.2 ka BP event: confirmation of a forcing mechanism by catastrophic drainage of Laurentide Lakes." *Quaternary Science Reviews*, (2006) 25, 62– 88.

3

Clarke G., Leverington D., Teller J. & Dyke A., "Superlakes, megafloods, and abrupt climate change." *Science*, (2003) 301, 922–923.

4

Ritchey, William A.; *The Archaeology of New York State* (Purple Mountain Press, 1994; reprinted from Bantam/Doubleday, 1965) p. 42. The C14 evidence is derived from pollen samples found at particular undisturbed stratigraphic levels around campsites of the "Lamoka" peoples in New York State, whose badly deteriorated bone structure in any case strongly inferred that these people were of European origin.

as “warmer” than today, and perhaps even “somewhat drier,” and is consistent with the approximately two degree Celsius Northern Hemispheric warming that was then ongoing in the hemisphere. It strongly suggests that the microclimate of New York State ~~in~~ during the Holocene Climate Optimum timeframe ~~for the warmed & changed~~ so much as to resemble modern southern New Jersey,; perhaps even Kentucky or North Carolina,; This period also corresponds to a strong ~~during this upper~~ peak shown in the Bond graph of Figure 2. Indeed, the very movement of the tree line ?Northern Canada, in Ontario and Quebec? ~~north, upwards of,~~ hundreds of miles northward in this period has been recorded using isotope reconstruction.⁵

Palynological (fossil pollen) sampling around undisturbed Lamoka [*Howell – provide where, when, what country etc – not obvious to me and probably to others...*] ~~people burials~~ graves during ~~in~~ the warmer part of the Holocene Climate Optimum revealed evidence of things growing then in that state which no longer live there, including the occidental-type people themselves,; These apparently aggressive hunters, ~~and who~~ may have made their way there ?from Europe? in the same manner as the Vikings did ~~in~~ ⁶similar ~~a6 to 7 ky later~~ during a period of longer-term natural global warming: the Medieval Maximum ⁷ ~~—much later~~.

5
The Ennadai in the Laurentian Shield in my co-authored book, *The Maunder Minimum and the Variable Sun-earth Connection*, p. 215

6
It is thought that the Medieval Maximum temperature averaged out was nearly a degree warmer than it was at the 20th Century’s end, making it at least one degree higher added to the one degree rise, the warmth probably unevenly spread. Given the primitive state of meteorology~~easy!~~ and Earth sciences we cannot reconstruct micro climates accurately. The Vikings made settlements in Nova Scotia then and had been – much like the war-scarred bones of the Brewerton Period people revealed thousands of years previously – attacked by the “natives” mercilessly. This contributed to their abandonment of L’Anse Aux Meadows, Newfoundland.

7
It is thought that the Medieval Maximum temperature averaged out was nearly a degree warmer than it was at the 20th Century’s end, making it at least one degree higher added to the one degree rise, the warmth probably unevenly spread. Given the primitive state of meteorological and Earth science we cannot reconstruct micro climates accurately. The Vikings made settlements in Nova Scotia then and had been – much like the war-scarred bones of the Brewerton Period people revealed thousands of years previously – attacked by the “natives” mercilessly. This contributed to their abandonment of L’Anse Aux Meadows, Newfoundland.

Pseudo-decadal averaging solar insolation : zeroing in on short term climate effects

“The 850 BC event”: lower solar activity with higher precipitation initiates a human crisis in The Netherlands and aridity in the tropics: changing populations, changing cultural behavior?

[Howell – if you state “pseudo-decadal averaging in the title, you should define or explain it!]

[Howell broadening - see “1500 & 700 BC major events”]

[Howell - It would really help if you tied a LARGE NUMBER of devastating events around the world together. You actually already have several examples, but my guess is that its much larger than this. I haven't yet read a book that addresses this point precisely. This is controversial, but the proponent (Velikovsky and using similar lines of research) supports his points quite well, and much of the criticism by scientists has been, to put it politely, highly [dishonest; and/or dysfunctional and/or delinquent and/or hypocritical] - and that point is EXTREMELY well documented!]

There was a degrading of weather that was noted in proxy data drawn from peat bogs in c. 850 BC in the Netherlands. Climate-related changes in precipitation and temperature are reflected in the changing species composition of the peat-forming vegetation.⁸

Plant remains can be identified and, by using ecological information about peat-forming species, changes in species composition of sequences of peat samples can be interpreted as evidence for changing local hydrologic conditions, often linked to climate change. At the start of the abrupt climate shift (**middle, see Figure 3 below**) – and coincident with an abrupt decline of solar activity – the atmospheric circulation changed, leading to cooler and wetter climate conditions.

In lowland regions in the Netherlands for example, the climate shift caused a sudden, considerable rise of the groundwater table so that land you could grow and herd on was

8 Ibid Beer J., and van Geel (2008)

transformed into wetland, where peat growth started. Farming communities living in such lowland areas were forced to migrate because they could no longer produce sufficient food.⁹

The rise of the water table forced the farmers to migrate to well-drained areas in the northern Netherlands where salt marshes offered them new fertile land. (Phase two and three, middle and upper in Figure 3). The rise of the inland water tables is attributed to increased precipitation.

Evidence from proxy data in this timeframe also suggests climate cooling events in France, Switzerland, Central Russia, and the Andes in South America, these latter due to palynological evidence revealing vegetation shifts consistent with global cooling. There is also evidence for dryness in Central Africa and Western India. Magny (2004)¹⁰ showed that over a period of several millennia the presence of lakeside villages in south-eastern France and adjacent Switzerland was strongly linked with lake levels ~~solar activity~~. Lakeside villages were present during periods of high levels of solar activity, as evidenced by reduced atmospheric C14. As previously mentioned, the production of C14 is regulated by solar activity, and therefore periods of increased mire surface wetness and increased lake levels (peaks of 14C!) have been interpreted as evidence for solar forcing of climate change (the effects of sudden declines in solar activity).¹¹ No lakeside villages occurred after 850 BC. [Howell call for clarification - Here you leave us hanging with no explanation. Is this to say that after 850 BC and up to the present day, there have never been villages at these lakeside sites? Why? It seems that they would likely still be warm enough, or have they dried up?]

9 Van Geel B., Buurman J. & Waterbolk H.T. "Archaeological and palaeoecological indications of an abrupt climate change in The Netherlands, and evidence for climatological teleconnections around 2650 BP." *Journal of Quaternary Science*, (1996) 11(6), 451-460.

10

Magny M., Holocene climate variability as reflected by mid-European lake level fluctuations and its probable impact on prehistoric human settlements." *Quaternary International*, (2004) 113, 65-79.

11 By wiggle-matching 14C measurements, high precision calendar age chronologies for peat sequences can be generated (Blaauw et al. 2003), which show that mire surface wetness increased together with rapid increases of atmospheric production of 14C during the early Holocene, the Sub-boreal-Sub-atlantic transition : a sharp increase of 14C production and evidence for wetter conditions and the LIA (also Wolf, Spörer, Maunder, and Dalton minima of solar activity).

A link between the climate shift around 850 BC and the evidence for a subsequent increase in human population density has been made in Northwestern Europe.¹² A climate crisis in the first instance caused an environmental and social crisis. A collapse of societies resulted in a weakening of the position of dominating groups, which brought about a change in the social structure of farming communities. This facilitated the introduction of a new technological complex, which again created further social change combined with a leap forward in production, food consumption, and population density. In this case there was apparently no catastrophic decline in human existence, but a major disruptive shift due to climate drivers for the cooler.

In south-central Siberia near this time, archaeological evidence suggests an acceleration of cultural development and a sudden increase in density and geographic distribution of the nomadic Scythian population after 850 BC. Van Geel et al (2004)¹³ hypothesized a relationship with an abrupt climatic shift towards increased humidity (equatorward relocation of mid-latitude storm tracks). The hypothesis is supported by pollen-analytic evidence. Areas that initially may have been hostile semideserts changed into attractive steppe landscapes with a high biomass production and carrying capacity. Newly available steppe areas could be utilized by herbivores, making them attractive for nomadic tribes. The Central Asian horse-riding Scythian culture expanded, and an increased population density was a stimulus for westward migration towards south-eastern Europe. *[Howell's useless comment - Yes! I just finished reading about Scythians and Cimmerians (indirectly) in two references. You are hitting one of my key themes – global Climate effects are misleading and trivial – Regional effects are probably 3 to 10 times stronger, and often go in directions completely different from the mean global trend. Averaging them all out gives you the pathetically weak global effect, with is not a great driver of much of what we see.]*

There is strong evidence for climate change in the Central African rain forest belt around 850 BC.¹⁴ Palynological (pollen-analytic) studies point to a drastic change in the vegetation cover

12 van Geel, B. and Berglund, B.E., 2000. A causal link between a climatic deterioration around 850 cal BC and a subsequent rise in human population density in NW-Europe?, *Terra Nostra* 2000/7: 126-130

13 Van Geel B., Bokovenko N.A., Burova N.D., et al. "Climate change and the expansion of the Scythian culture after 850 BC: a hypothesis." *Journal of Archaeological Science* 31(12), (2004) 1735-1742.

14 Van Geel B., van der Plicht J., Kilian M.R., et al. "The sharp rise of $\Delta^{14}\text{C}$ ca.800 cal BC: possible causes, related climatic teleconnections and the impact on human environments." *Radiocarbon*, 40(No. 1), (1998) 535-550.

(from predominantly rain forest to a more open savannah landscape) as a consequence of aridity. A population of farmers migrated from the south into the area. The contrast between this change to dryness in central west Africa and the contemporary increase of precipitation in the temperate zones fits well with the hypothesis that, after a decline of solar activity, there was a decrease in the latitudinal extent of the Hadley Cell circulation and consequently the monsoon decreased in intensity, while the mid-latitude storm tracks in the temperate zones were enhanced and moved in the direction of the equator.¹⁵

A dryness crisis caused by a weak monsoon intensity in north-west India after 850 BC also supports this hypothesis¹⁶. Moving toward the Americas, massive glacier advance in the south-central Andes of Chile, probably resulting from an equator-ward relocation of mid-latitude storm tracks (like in the Northern Hemisphere), forms part of a wealth of evidence for worldwide climate change around 850 BC.¹⁷ Evidence from paleodata indicates that the climate shift around 850 BC occurred suddenly, probably within a decade and the 14C record points to a sudden, Maunder Minimum-like decrease of solar activity as the cause of this event (called the Solanki Minimum).

The theory in this respect, taking a long view culturally, is **solar “hibernations”** and the rise and fall of civilisations, and loosely considers not just temperature, but perhaps more precipitation, and not just war, but several plagues and other climate disruptions, such as cloudiness as a negative feedback of say, albedo, attendant precipitation shifts, and the resultant droughts, floods, and crop failures, as well as crop diseases, insect plagues (such as locusts), agrarian society economic failure (as seen in the well-documented “850 B.C. event” just related) human

15

Van Geel B. & Renssen H., "Abrupt climate change around 2650 BP in North-West Europe: evidence for climatic teleconnections and a tentative explanation." In: *Water, Environment and Society in Times of Climatic Change* (Eds A.S. Issar & N. Brown) (1998), pp. 21-41. Kluwer Academic Publishers, Dordrecht.

16

Van Geel B., Shinde V. & Yasuda Y., "Solar forcing of climate change and a monsoon-related cultural shift in western India around 800 cal. yrs BC." In: *Monsoon and Civilization* (Eds Y. Yasuda & V. Shinde), (2004) pp. 275-279. Roli Books, New Delhi.

17

Van Geel B., Heusser C.J., Renssen H. & Schuurmans C.J.E., "Climatic change in Chile at around 2700 BP and global evidence for solar forcing: a hypothesis." *The Holocene*, 10(5), (2000) 659-664.

pandemics and wars. Also there is a feeling that the zones of huge agricultural productivity wander with the longer term ~~solar cycles~~ Milankovic Earth orbital cycles. *[Howell comment - Milankovic cycles aren't typically described as "solar", although I guess anything in the solar system could get that labels. The key thing is that you should clarify terminology early in the paper, perhaps have a glossary, and be precise and consistent in the wording, or your readers (and reviewers!) will get lost.]* and even short-to-mid-long term solar and other earth and astronomical pseudo-cycles. *[Howell possible analogy - "Europeans have seen the march up the mighty glaciers up and down their valleys several times over the last thousand years. Is it not possible that climate variations (psuedo-cycles if you prefer) may have had some of the same effect on armies of conquest marching across the continent? Have mountain dwelling people drawn that analogy in poetry or prose?]*

As solar insolation decreases, big regional climate effects differ in nature and trend. An intriguing dichotomy of "desertification" versus "junglification." [Howell broadening and clarification - see "desertification versus junglification" link]

The end of the event, however, seems to have been gradual (a time-transgressive passing of thresholds) so that, given present knowledge, it is not yet possible to pinpoint an end of the event. Changing climatic conditions at 850 BC may have been similar to climatic cooling shifts **during the LIA.**¹⁸

[Howell comment - That is a strange comment regarding the "end of the event of 850 BC. Do you mean "locally" - that is, within a few hundred years? It looks like you mean even to the present day, but I don't think that is what you meant. In any case, there seem to be major disruptions (and a solar hibernation around the time of Alexander the Great circa 400 BC or something like that (I'm not looking at the graphs while I'm doing the first draft of comments).]

Figure 3. Three views of climate change around 850 BC as revealed by increases in peat bog growth in The Netherlands. Phase A (base), warm and dry. Phase B (middle; c. 850-730 BC) cold and wet. Phase C (top) a return to warmth (After Beer & van Geel, 2008)

The Little Ice Age (LIA)

Sandwiched in the Bond graphs (see Figure 2) in tight amplitudes, barely visible, from the mid-1500s to the end of the 1800s is the phenomenon labeled such that it confuses most who wander onto the subject. That would be the anomalous LIA, caused either solely by the Sun / albedo, solely by geophysical events (volcanoes) or purely an ocean (hydrological) phenomenon. It may

¹⁸

Mauquoy D., Van Geel B., Blaauw M. & van der Plicht J., "Evidence from northwest European bogs shows 'Little Ice Age' climatic changes driven by variations in solar activity." *The Holocene*, 12(1), (2002) 1- 6.

be caused a little by all and it defies a cyclical cubbyhole. In any case, you cannot confuse it with the deep ice age, laid out in Figure 1 in a c. 80,000 year run.

[Howell critique – Yikes! This last paragraph seems off-base to me? It seems to fall into the trap of the “fiction of monotonic movements in climate, that was addressed earlier! Why is the LIA any more anomolous than the Younger Dryas, Holocene maximum? Look at the glaciation chartsw – it's dipsey-doodle all the time. It would require an explanation if the curves were too smooth, not when they bounce around.]

The term “Little Ice Age” was coined by a journalist, probably in the 1930s according to U.S. Geological Survey scientist F.E Matthes (in 1940) as he described glacial re-expansion in a post-Pleistocene context on page 398 of an AGU report:

“... They have re-expanded since then to the limits from which they are even now receding, and as their re-expansion has been of considerable magnitude, to judge from certain specific cases, there appears to be a warrant for the assertion that the present age is witnessing a mild recrudescence of glacial conditions – that it is, as a clever journalist has suggested, a separate “little ice age.”¹⁹

What nags at the understanding of the LIA, other than the confusing label, is its locus in the range of two well-known solar minima: the Sporer (possibly a grand episode) and the Maunder. (definitely a grand solar episode). If a separate phenomenon from any solar activity it certainly worsened the climate conditions in the Northern Hemisphere. We can see that from the familiar graph of 14C per mille and the the sine curve below. In any case, the LIA's end coincides with solar insolation increases overall since Solar Cycle 11 or so, and could be one of the contributory effects to a warmer Twentieth Century, very much so after c. 1924.”

Exacerbating the effects of prolonged solar minima was the coincidence of two closely-occurring grand minima episodes, one after the other. [Howell – four – Wolf, Spoerer, Mauner, Dalton by common convention, although one could argue that the Sporer and Maunder were “bigger”] This is covered elsewhere in graphic detail.²⁰ Weather in Europe had already been generationally “different” from what Sporer and Maunder Minimum-living old timers – a lot like my Vermont

¹⁹ Matthes, F.E., “Committee on Glaciers, 1939-40.” *Transactions, American Geophysical Union, 1940* pp. 396-406

²⁰ Ibid, Soon, W., and Yaskell, S.H., The Maunder Minimum and the Variable Sun-e,” (WSP:2003)arth Connection

analogues, above – recalled, which fell into what some think was the coldest year in c. eight thousands, culminating at the end of the year 1683, once called the “hardest” freeze (of the Thames River in England) in “postglacial times,”²¹ (that is, prior to c. 10,000 years B.P). But from the Bond graph, it looks more like c. 8,000 years before 1683.

Local shorter term warming since 1880 (post-LIA) in the altered permanent residency of migratory birds northward

[Howell's cop-out - I'm not as ready to tackle this section from 1850, given my need to do the modelling in Sep-Oct that I referred to. Actually, I started in May, and have great difficulty to find the time. My father and I dd argue against the conventional “volcanoe” drive of “summerless years”, and there are tons of other details, but the ones that stand out are:

- *1816 was last “summerless year”, often blamed on Tambora - more likely Dalton minimum.*
- *?14??. 1805 & 1941? Charles ?II? Of Sweden, Napoleon, Hitler all crushed by far more severe than normal Russian winters*
- *1350 Bubonic Plague, 1918 Spanish flu*
- *difference between US an European T series..}*

We now do a convergent thing and make a tie-in to the science of ornithology. Rather than think this a digression, it is a convergence from other branches of science used to lend weight to that branch of science attempting to understand natural local shorter term Earth warming. This exercize lends familiarity to climate change that can be studied at some leisure. The following is proof that species of birds have moved permanently northward since the end of the LIA, which is a hemispheric phenomenon.

Some old timers in Vermont tell tales related from grandparents on downward on how much colder it was in the “old days” (roughly 100 years ago) and somewhat earlier. A scientific book on Massachusetts birdlife²² as it applied to state agriculture in 1905 backs them up.

21 _____ Ibid, Soon, W., and Yaskell, S.H.

22 _____ Forbush, E.H., *Useful Birds and Their Protection* Mass. State Board of Agriculture Publication (Wright & Potter: 1905). He was as professional a biologist as you could get then.

ornithologically. It was carefully assembled by numbers of good observers reporting to a professional bird biologist (E.H. Forbush) and relates later times for spring arrivals of many species, and earlier migrations of them south and west in the fall way back then, compared to modern field guides. Some species common in Massachusetts now were *rare* there in 1905 (like the Tufted Titmouse and Cardinal) or never occurring (like the soft-footed Mourning Dove – which became a year-round resident in Massachusetts about the 1940s) and the House (or Mexican) Finch, which arrived in the U.S. from the south about 1940 into Texas,²³ and which has been a common summer and fall bird in Massachusetts for some years now. Many birds listed as *seasonal* in the 1905 book are now *year round residents* there today. So it must have been cooler locally before c. 1900 in Massachusetts compared to after that time. Warmth and resource abundance brought them further north. And perhaps the strength of the magnetic field? This northward migration of passerines must have been ongoing since the 1860s if not earlier. Perhaps strengths and weaknesses in Earth's magnetic field signal the passerines to go farther afield north or south, depending on the signal strength they receive in their olfactory (breathing) glands.²⁴ In any case, their increased migrations northward for longer periods starting happening before the intense and widespread use of fossil fuels among an Earth population of less than a billion humans, which is only recognizable from the mid-1900s, but that some date to c. 1850.

An overview of civilization rises and falls matched to variations in solar insolation from 1600 BP to present

[Howell – I think that it would help enormously to show Ken Tapping's plot of solar insolation, as most scientists aren't aware of the changes!!]

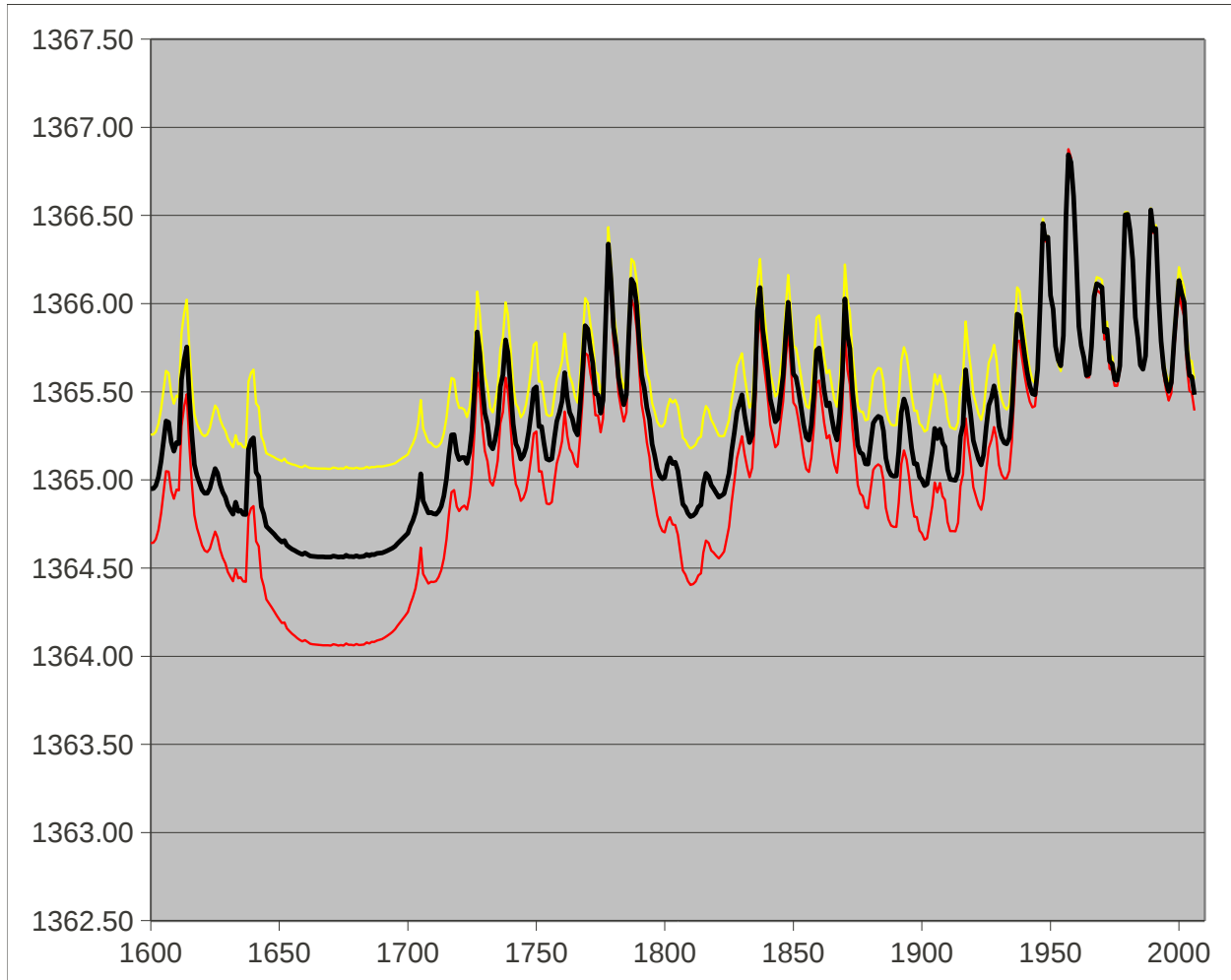
23

Peterson, R.T., *Birds of Eastern and Central North America* (Houghton Mifflin: 2002)

24

It is also interesting to note that passerines are now known to have an organ that can detect the Earth's magnetic field for navigation. Bobolinks (or, Ricebirds) *Dolichonyx ozivorous*, common in the U.S. east, have Iron Oxide around their olfactory glands, and in bristles extending from nasal cavities. "Closely proximal nerves fire in response to changes in magnetism to provide the exquisite sensitivity necessary for navigation by the Earth's magnetic field." ("Close Up Science," *Valley News*, Vermont, July 25, 2011)

WARNING: This is an unpublished, intermedate chart. I would have to dig around for his published version, and others have produced similar graphs more recently. We would need Ken Tapping's permission to use the appropriate version!



The following tables show averaged peaks (341.600 Wm²) in solar insolation and dips (341.400 Wm²) from 1,600 years ago to present.

The tables bear some study and serious consideration as regards society, sickness, war, and the Sun's relative strength. (Though droughts, plague and war etc. occur along with the mapped out solar insolation we do not imply that the Sun is the sole (or even direct or necessarily even indirect cause of the listed droughts, plagues, and wars.) The 2-way arrows show the rises of various civilizations, to their respective terminus' points and petering out into newer or lapse into take-over by other civilizations. The color-coding reveals, from the top down, the Mesopotamian, Egyptian (Persian-Muslim) Indian (Marappan, Gupta), Mediterranean, European,

Chinese, and Mesoamerican/Anasazi-Mississippian-Woodland societies on many of the world's landmasses.

The green blocks up and down and left to right are periods of presumed maxima and the white/blue areas to either sides, presumed minimas, regardless of their strengths or whether or not they were grand episodes. The rose-colored areas represent extremely hot periods (as shown earlier in the pseudo-decadal analysis revealing the Holocene Climate Optimum. The blue gray areas represent severe droughts.

Several things stand out. One is a confluence of arrows (loosely interpreted as population disruption or change or both) in areas between 800 BC (the Solanki Minimum) heading into the weaker maxima periods found around 600 nearly to 400 BC. From the work of Van Geel et al gone over earlier in this chapter, it is amply clear that in this minima period, there was considerable civilization disturbance (as he and colleagues amply outline) in the Netherlands and elsewhere, and weather in part is strongly behind it.

In the 800 BC timeframe the Phoenician and Etruscan civilizations transform into the earliest parts of the Roman Empire, this empire in full swing by 509 BC. The rise in European population falls off after the Roman Empire's fall c. 300 years AD. In the relatively warm period stretching from c. 550 AD – 850 AD, Charlemagne encouraged the rise of feudalism and it can be said that this labyrinthine system of vassal and sub-vassaldom was popular enough to take root and help propel (from about AD 700) at least mid-Europe's population from c. 23,000,000 to upwards of 73,000,000 humans by the year AD 1250 (through the Oort Minimum)²⁵ and into the Medieval Maximum. *This rise is the first such major reversal in human population growth since late Roman Empire times in this Northern Hemispheric sector (at least)*

1600 BC - 400 BC

for it had been sinking steadily in that sector up till then. The locus of this upward surge seems also to have been in what is today western Germany, north, and west to the Netherlands, then south to northern Italy and along the Rhine River. Honest histories will say that reasons for this period massive population growth of c. 10 million persons per century for five centuries in a row remains "obscure." That the rise coincided with massive agricultural production in west-central Europe, southward along the Rhine (prompting that very political yet mild growth, feudal and manorial life) is of course, not so surprising. But, what should *also* not be so *very* surprising is that agricultural yield and population growth at this critical juncture, *both* coincide with the Medieval Maximum which was very kind, climatically-speaking, to Western Europe. Curiously,

25

Harrison, J.B., and Sullivan, R.E., *A Short History of Western Civilization, Vol. 1: to 1776* 4th Ed. (Knopf: 1971) pp 208-209 for these figures and analyses. These in turn were drawn perhaps from Georges Duby, *Rural Economy and Country Life in the Medieval West* (Harvest)

North America, in the 550 AD-600 AD period, and again in 1,100-1250 AD timeframe, is burned up by drought.

In the Tapping Minimum of 400 BC to nearly 200 BC, the Persian Selucid civilization is taken by the aggressive and world-changing Roman civilization, the Maurya Dynasty in India dies out into the Gupta, and, following a weirdly even pattern from thence on, Chinese dynasties routinely die out, and subsequently re-form, in each solar minimum. This sodd pattern begins with the Chinese post-Zhou interregnum (403-221 BC), the Chinese so-called “Dark Ages” of 220 BC-581 AD (the Baliunas Minimum) to the start of the Sui Dynasty (581 Ad – 618 AD), to the Tang Dynasty’s demise nearing the Oort Minimum and the beginning of the Mongol Empire, including the Yuan Dynasty, all the way to the Ming Dynasty’s beginning in the Sporer Minimum, to die out in the even worse (LIA-aggravated) Maunder Minimum, whence it becomes the Qing (Ch’ing) Dynasty. The human suffering in the Chinese / mainland Asian context and framework in this particular period is well outlined elsewhere and bears reconsideration in light of this pseudo-decadal solar insolation data by Bill Howell. ²⁶

Not to be outdone, it seems, the Mesoamerican horizons show a similar pattern to the Chinese, in that the Hopewell people of the Mesoamerican Ohio Valley peter out in the Baliunas Minimum, the Anasazi (U.S. southwest/northern Mexican) civilizations rise at the very end of the Oort Minimum and die in the Wolf Minimum, and what Spain and Portugal wrought in this part of the world (to include, most prominently, the Aztecs) is well-known and documented, the Spanish tide itself dying out in or around the Dalton Minimum.

400 BC - Present

Taken on average, the amounts of arrows ending at a blocked line are about equal, whether or not we are looking at climate optimum (green) periods or the white and blue (climatically cooler, drier, windier) across the 1,600 – present timeframe. But a skew becomes apparent if we look at those civilizations from the northern Mediterranean upward to Northern Europe, including middle China and North America, versus the more southerly to Southern Hemispheric-occurring civilizations.

**Solar minima and recurrence of
civilization collapse, Northern
Hemisphere relative to the Southern
Hemisphere**

26 Ibid, Soon-Yaskell (2003)

<u>McIntyre Minimum</u>
Solanki Minimum
<u>Tapping Minumum</u>
Baliunas Minimum
Oort Minimum
Wolf-Sporer-Maunder Minima

[Howell - OOPS, In my work, at one time I INSERTED my own names for grand solar minima for which I didn't have a name on hand. Most of these DO have names from others, albeit I'm not sure how "official" they are. As author, you will probably want consensus names where that is well established and recognised. HOWEVER, I suggest that you be "flexible", putting in your own names if you feel it's appropriate. I definitely DO NOT agree with some names suggested for the next grand solar minimum, and here I think our foots should be put down to select a "heretical" scientist or group of them (Charvatova, Abdussamatov) who have been decades ahead of the other scientists, and who have been severely criticised for daring to suggest that the sun is important in climate!]

When talking of drought, on the other hand, another pattern emerges.

<u>Recurrence of civilization collapse in drought periods, not minima-dependent, Northern Hemisphere relative to the Southern Hemisphere</u>
Aegean Drought
"600 BC" drought
China Drought
S.American Drought
Mississippian and S.W. U.S Drought (1200s)

1. Howell's "Conventional" Paper Review Format

1.1 Skip over standard paper ranking setup...

Paper ID :
Title :
Assigned :
Due :

For each question, please use the following scale to answer (place an X in the space provided):

RATINGS

- 1 Superior
- 2 Good
- 3 Fair
- 4 poor
- 5 Not applicable

Quality of Methodology :
Quality of Work :
Soundness of Conclusions :
Significance of Subject :
Clarity :
Organization :
Priority Rating for Publishing in Neural Networks ("1" is highest) :

Is the abstract, and are the figures, legends, and references acceptable? If not please explain:

Please provide a brief and compelling argument supporting (a) your recommendations and (b) the above ratings:

Reviewer's expertise on the subject: Low Medium High

This reviewer's personal approach:

nomenclature examples:
p1c1h0.8 = means page 1, column 1 80% of the way down the page (very approximately)
C2. = means Comment section #2 WEAKNESSES (note that actions by the authors are NOT required for the points)

++-----++

1.2 ACTIONS REQUESTED OF THE AUTHORS

-

1.3 COMMENTS ONLY

- actions by the authors are NOT required for the points listed below. Perhaps some of these comments will be helpful in some way.

((Main paper contributions, positive aspects, observed deficiencies, and suggestions on how to improve them:))

++-----++

1.3.C0. SPECIAL SECTION: COMMENTS FROM AN EXPERT IN THE AREA

(if applicable to this review)

++-----++

1.3.C1. STRENGTHS OF THE PAPER:

++-----++

1.3.C2. WEAKNESSES:

(again, changes to the paper are not require for these comments)

++-----++

1.3.C3. QUESTIONS:

(no need to answer)

++-----++

1.3.C4. DETAILS and GRAMMAR:

(again, changes to the paper are not require for these suggestions)

Most details are written straight into the Word document in “Track Changes” mode. Usually as a reviewer I cannot do that as pdf format is supplied, but this makes things MUCH faster!

Special mention of details

++-----++

1.3.C5. REFERENCES

(using a quick web search, as opposed to checks using Scopus or standard indexes)

C5a) Are references legitimate (using a quick web search and personal familiarity with references)?

C5b) Is this paper significantly different from previous papers by the same authors?

C5c) Is the relevant literature well represented in breadth and Depth?

The following sections are not used in this section, as the “THOUGHTS” are covered in the section “5. Howell's other perspectives”, and confidential comments aren't needed in this situation

THOUGHTS:

(again, changes to the paper are not require for these)

Here are some long-winded thoughts that are not really relevant to the paper review per se... For interest only, even if that.

These are separated from the "COMMENTS" above because they are less relevant to the actual paper.

CONFIDENTIAL COMMENTS

for review chair / committee use only: _

2. Stylistic line-of-argument points

[Howell suggestion for inclusion – see “Charvatova's link between Solar Inertial Motion (SIM) and Climate”]

This is a good point where you have clarified key approaches you are using in the rest of the Chapter. I think it's important to add Charvatova's results showing the most powerful link between climate and any hypothetical climate drivers that I know of (yet don't even take this as solid casuation!!!). Charvatova's work follows a long recurring tradition established by the very first theory for the sunspot 11/22 year cycles → “Johan Rudolph Wolf's (1816-1893) illustration that they may relate to planetary orbits (Jupiter-Earth-Sun in particular, but the others as well in Charvatova's theory)

[Howell broadening and clarification – see “desertification versus junglification” link]

[Howell - here I think it appropriate to raise questions, as I certainly don't have a strong foundation for this. In any case, a powerful question is far more important than powerful answers.]

We are all familiar with a process that we will label “desertification” here. That is, a once fertile breadbasket becomes a barren desert, no longer able to support the flourishing civilisations that live there. Parts of Mesopotamia, The Harrupans in the Indus valley of Pakistan, and many other areas of the world have sad stories such as these.

But is there also a process of the fall of societies and perhaps civilisations through “junglification”, that is the encroachment of jungles or swamps that render agriculture problematic, and big increases in temperature and humidity that hinder human thought and energy? (This is obviously a theory for Canadians who have trouble in great heat and humidity.) And if it is a measurable effect, do Angkor Wat, the Mayans, and perhaps other civilisations provide examples?

endsection

3. Implied Hypothesis and its expression

endsection

4. De Jager's Solar & Astronomical Thinking

endsection

5. Other perspectives

BROADENING, not for inclusion:

You can't put everything in your book, and it is NOT intended that the following material be included.

What you CAN do, however, is post such comments and discussions blogs to a site that is hyperlinked in the book.

[Howell – see “broadening comments” on theories/ views of history and its drivers]

From ?ancient times? entertaining historical perspectives have included:

- Hunting, fishing, and agricultural The ancient, powerful, and capricious gods, brought favour or curse to chosen peoples or their enemies.
- “Does history make the man, or does the man make history?”
- A parent dichotomy is to contrast historical theories that emphasize the sledgehammer of nature to the

Recognizing that dichotomies are simplifications most useful for pedagogy and for promotion of concepts, the theme of this chapter is not to to be boxed in by overly simplistic contrasts such as these, but to

I

[Howell – See comments on “The full timescale – seconds to the age of the Earth” for climate, solar activity, galactic rays,]

The glaciation cycles are VERY pertinent to your analysis of history and solar grand minima! Actually, the dominant Milankovic theory for glaciations (incomplete, doesn't fully work) is a combination of assuming constant solar insolation, but modulated by Earth orbital parameters. There is a very impressive cosmic/galactic ray hypothesis for glaciations as well, and this is at least partly non-solar-driven.

[Howell – see “broadening comments” on glaciations models (I have several graphs over 6 My)]

(I have several graphs over 6 My)

[Howell question broadening – on Bond pseudo-cycles (sometimes I say quasi-cycles)]

[Howell broadening – see “1500 & 700 BC major events”]

[Howell - It would really help if you tied a LARGE NUMBER of devastating events around the world together. This is controversial, but the proponent (Velikovsky and using similar lines of research) supports his points quite well, and much of the criticism by scientists has been, to put it politely, highly [dishonest, and/or dysfunctional and/or delinquent and/or hypocritical] - and that point is EXTREMELY well documented!]

USELESS Comments: not for inclusion

I couldn't help commenting here an there...

[Howell – see useless titbit - “vegatative following of the ice sheets”]

I was very surprised to see maps (every 1000 years or so) of the vegetation in North America as the ice sheets retreated. I was expecting “bands of artic through current-day vegetation” to follow the edge of the ice sheets. Ghat's not what happened – it appears that soon after land was cleared of ice sheets, the vegetation that established itself was essentiallhy the same that remained there with time (plus or minus). Maps from Geological Survey of Canada...

endsection

enddoc