The Solar Cycle is responsible for extreme weather and Climate change According to Tree ring and Hunger Stone events

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Abstract

Recent discovery of the relationship between the location of the North American Jet Stream and extreme weather is a breakthrough in the understanding of solar forced climate change.

Five episodes of extreme weather over a period of 282 years deduced from tree ring data show meandering of the North Atlantic Jet stream. It is fair to say that the summers of 2017 and 2018 qualify as a sixth event because of world-wide extreme weather in the northern hemisphere and also globally, resulting in flooding, wildfires and drought on every temperate continent. The monsoon has truly gone global.

The tree ring data is the only time series data available that determines the position of a jet stream. Moreover, tree ring extremes correspond to weak portions of the solar minimum of the sunspot cycle, a cycle that is a proxy for the magnetic shield of the sun. The so-called 'Hunger Stones' also mark notorious years of extreme drought in Central Europe. The emergence of the Hunger Stones and the tree ring data independently support each other and support a solar cycle climate hypothesis.

These extreme weather events correspond (75%) to years of sunspot minima. Therefore, it is likely the extreme weather is a function of the solar cycle. Solar forcing is an important factor in causing extreme weather. It follows that the sun controls Earth's climate.

Figure 1: Kochi City, Kerala State, India. 20 August 2018 (The Hindu.com).

Figure 2 Horseshoe Falls portion of Niagara Falls (dates from ca. 1909 – 1912).

Introduction

The North Atlantic jet stream currently wanders northward and southward as it meanders around the globe. Tight bends in the flow are called Atmospheric Rossby Waves after an oceanographer who recognised them in the ocean currents (Rossby, 1939). The recent emergence of a ‘Polar Vortex’ in North American weather forecasts is an Atmospheric Rossby wave in the jet stream that brings Arctic air deep into the North America (Figure 3). The Rossby wave also carries warmer air north between Polar vortices. As long as the wave moves from west to east in the Prevailing Westerlies, the weather created is transitory.

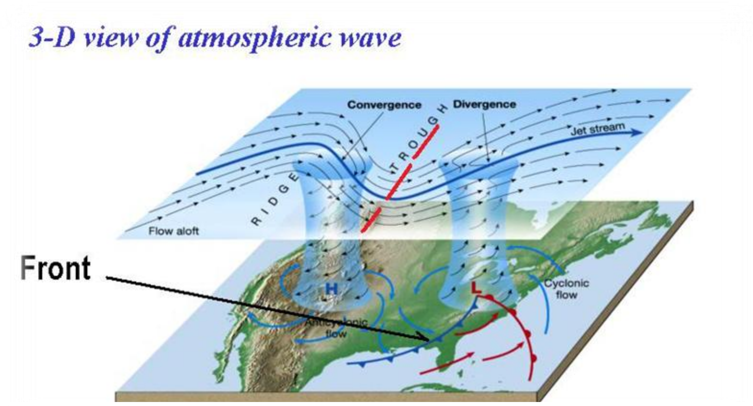

Figure 3: Cartoon depicting the interrelationship between jet stream Rossby wave and surface weather.

If a Rossby wave, however, becomes a fixed standing wave, it will result in extreme surface weather. This effect applies globally as the jet streams circle the earth in the thrall of the coriolis affect. When a Rossby Wave becomes a standing wave, a cold front can behave like a stuck lawn sprinkler and produce unusually heavy rain overwhelming equilibrium systems causing flooding; it can cause drouth[1] in its wake. In summer, thunderstorms commonly ignite wild fires in the lee dry areas. Apparently, when the Jet Stream achieves a stable standing wave it can create havoc.

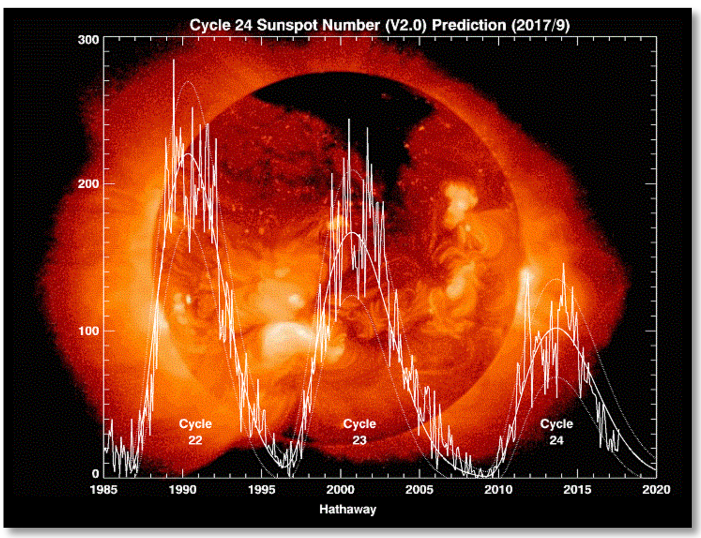

Fig 4: The last three solar cycles have been smaller than cycle 21 which peaked in 1980. All three are noticeably bimodal.

Meandering Rossby wave anomalies in the Atlantic jet stream track began to appear in the middle 1990s (Francis and Vavrus, 2015). Each succeeding sunspot peak since 1980 cycle 21 peak has been smaller (Fig.4). Cycle 24 just ending is the weakest in 110 years, since Cycle 14 (1902-1913); toward the end of Cycle 14, Niagara Falls froze over and people walked across Horseshoe Falls (Figure 2), and there was significant media fear of the next ice age.

Extreme weather at differing latitudes was reported by Trouet *et al.* (2018) for five years (Table 1). They teased out the connection to extreme weather and the latitude of the North Atlantic Jet stream using the maximum latewood density records of tree rings in August over the period from 1725 to 2007. It may be inferred that the summer of 2018 qualifies as a year of extreme global weather also because of the wildfires and flooding on a global basis. The entire period from 2016 to 2018 qualifies as extreme weather for North America (Manns, 2016).

British and northeastern European weather for these years defined by Trouet (***et al. op. cit.)*** are opposed. When one region is cold and wet the other is typically hot and dry on a proverbial seesaw. This combined

[1] A dust bowl term: Granddad Manns always pronounced it “Druth”.

with the latitude data imply the existence of a standing Atmospheric Rossby Wave in August of those years separating and governing Britain and northeastern Europe areas and their extreme weather.

RESULTS

Table 1: Five Years held to represent extreme weather as delineated by August tree rings over a period of 282 years (Trouet, *et al., op. cit.)*. Eighteen (18) years inscribed on Hunger Stones document low water on the Elbe River at Decin, Czech Republic and four years from Dresden Germany. The years 1417 and 1616 inscribed on two of the the Hunger Stones predate the reliably recorded solar cycle and thus are not included; 1893, 1899, 2003, and 2015 are from a Dresden, Germany, Hunger Stone.

Tree Rings	1782	1799	1912	1976	2007
Hunger Stones	1716		1842		1911
	1746		1847		1921
	1790		1868		1930
	1800		1892		1934
	1810		1893		2003
	1811		1899		2015

Additional support to tree ring analysis has become available in the ‘Hunger Stones’ of central Europe. Due to dry weather the water level in the Elbe River has dropped, revealing boulders that were once used to record low water levels. More than a dozen Hunger Stones have been found in and near the town of Decin, Czech Republic, along the banks of the Elbe River. One Hunger Stone near Dresden has four years scribed. The earliest year currently visible is 1616, but the oldest year cited is 1417[2]. The name ‘Hunger Stone’ is self explanatory. Table 1 lists 18 years of extreme weather in central Europe as chiseled on Hunger Stones and 5 years represented by tree rings.

This paper compares the years of weather extremes to the solar cycle. Sunspot cycles have been studied since sunspots were discovered by Thomas Harriot (1610), Johannes Fabricius (1611), Christophe Scheiner (1611), and Galileo Galilei (Brody, 2002).

The solar cycle has been tested against economic cycles, agricultural cycles, and numerous other cycles in nature (Brody, ***op. cit.***). This paper compares the years of weather extremes compared to adjusted solar record from the Royal Observatory of Belgium. Of the combined extreme dates, 75% correspond either perfectly or reasonably well with solar minima of the sunspot cycle.

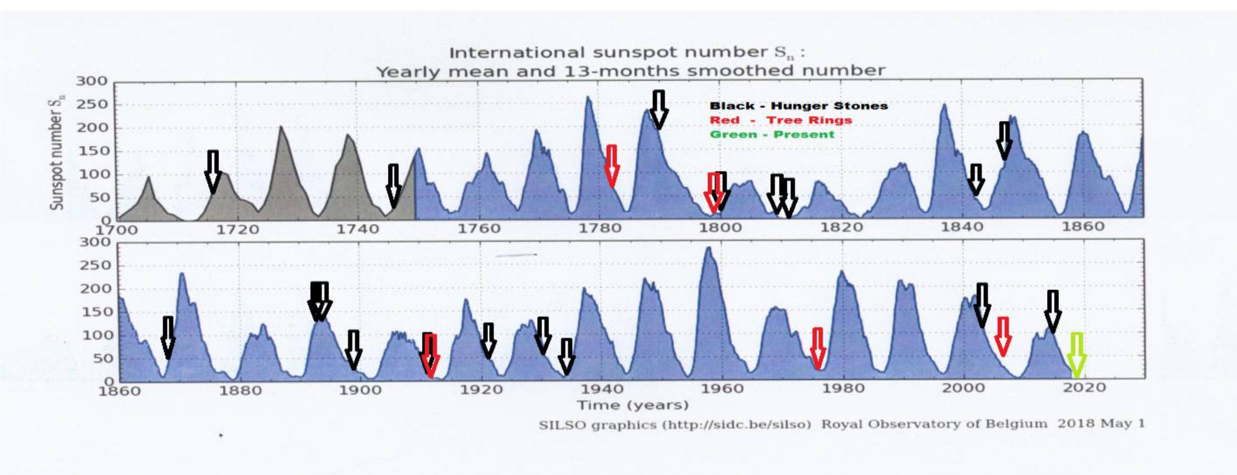

Figure 5: Arrows point out the years of extreme weather mostly at or near the solar minima delineated in August tree rings from 1725 to 2007 and scribed into the emergent ‘Hunger Stones’ along the Elbe River. 18 out of 24 (75 %) extreme weather years occur in weak solar minima. One arrow marks the current year, 2018.

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[2] "If you will again see this stone, so you will weep, so shallow the water was in the year 1417."; Fig. 7, (Business Insider.com, 27 August 2018).

Extreme weather is clustered around Solar cycle 5 (April 1798 to August 1810), and, again, bracket Solar cycle 14 (January 1902 to July 1913) and not surprisingly, Cycle 16 (1920 to 1935) and there is a last cluster around recently ended cycle 24. All were weak, similar to cycle 24 which just ended.

It can also be observed that extreme weather may follow decreases in amplitude over two or more weakening declining cycles. From Figure 4, one would expect a record of extreme weather on or about 1755. The following are records from 1755-1758 reported in the Booty Meteorological Information Source housed at the British Library.

> 1755, 1756 & 1758 All wet summers in the London area. More generally, April of 1756 was notably wet by the EWP series: amongst the top 3 such-named months. (See also 1782 and 1818).
>
> 1756 (May) May 1756 was notably cold. With a CET value of 9.1deg C, this placed it just outside the 'top-10' or so coldest Mays in that long series, with an 'all-series' anomaly of over -2C.
>
> 1756, 6th May: Almost every day for a fortnight there has either been snow (large flakes) or large hailstones, and excessively cold. (as reported in the Journals of Ralph Jackson/Newcastle upon Tyne).

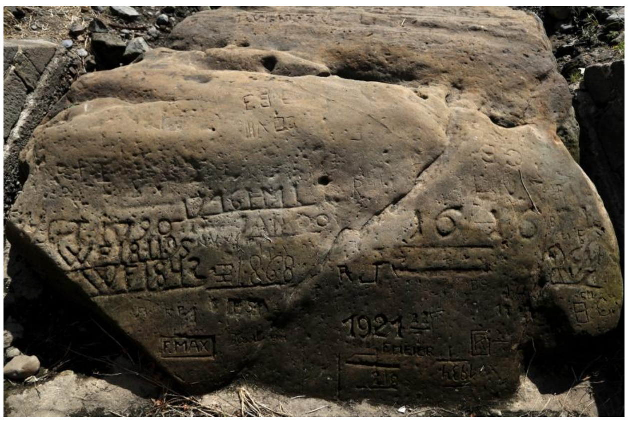

Figure 6: The years 1616, 1716, 1790, 1811, 1842, 1868, 1921are inscribed into a stone (near Decin, Czech Republic).

Figure 7: The years 1417, 1616, 1746, 1790, 1800, 1811, 1842, 1847, 1868, 1890, and 1900 are inscribed (near Decin, Czech Republic).

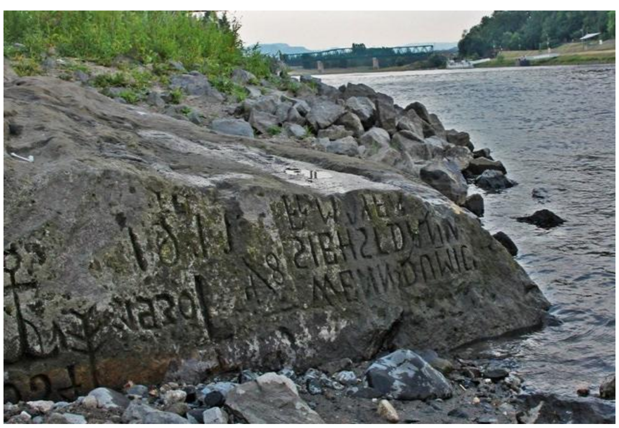

Figure 8: The years 1911 and 1930 are cut in this stone (near Decin, Czech Republic).

Figure 9: The years 1893, 1899, 2003, and 2015 are inscribed on this stone (near Dresden, Germany)

DISCUSSION

It is not sufficient to show a correlation between any two items of interest to suggest a connection. After all, the alleged connection between nicotine and lung cancer is accepted but has never been proven; neither has the connection between carbon dioxide and global warming. Each is an hypothesis waiting for experimental support. There are solid scientific reasons we have seen no experimental support. From the time of Arrhenius (1896, 1906) to NASA, it has been impossible to resolve the relative effect of carbon dioxide and water vapour. The subject matter is complex and to isolate a repeatable test is not possible, or experiments were performed but failed to support the hypothesis and were never reported. The latter possibility would never be revealed.

For a sun – climate connection there are several lines of evidence supporting an hypothesis that the sun is fundamentally responsible for climate change - both warming and cooling. Firstly, Friss-Christensen and Lassen (1991) estimated a 95% correlation between the temperature trends of Earth for the northern hemisphere temperature anomalies between 1861 and 1989 (128 years). They plotted anomalous temperatures against the frequency of the sunspot cycle. When the peak frequency (spacing) was close together, the northern hemisphere warmed; when the peak frequency was spread, the northern hemisphere cooled. The peak frequency method trumped many early sunspot cycle studies which used the sunspot number. Frequency capitalizes on the trend of several 11+ year cycles in a row; perhaps 33 to 45 years for a trend to build in the climate that otherwise went unnoticed because of the human research lifespan. But, correlation is not causation.

The cloud theory of Svensmark (Svensmark, ***et al.***, 2006), however, is a predictive supported theory that states more clouds are likely to form during solar minima than any other time. Clouds are nucleated by cosmic radiation from deep space normally blocked by the sun's magnetic shield. When the shields are down, in a solar minimum, it rains or snows more than when the sun's magnetic shield is in place. Moreover, Earth's albedo from snow reflects Sun's rays back to space.

The same research group, accordingly, at the Technical University of Denmark built a 7 m^3 cloud chamber in the basement of their lab in Copenhagen. The objective was to simulate the atmosphere and test for cloud nuclei. The reaction was nearly instantaneous; visible cloud nuclei droplets formed in a matter of seconds (Svensmark, ***op. sit.***). The experiment was duplicated later in the Large Hadron Collider and results repeated yet again in a high altitude vacuum chamber. Hadron gave the directive that the experiment could be published but not the conclusions.

Standing waves of the Jet Stream are clearly responsible for extreme weather. Why the jet stream achieves a stable standing wave is a question beyond this report. I will suggest a hypothesis. The atmosphere shrinks during solar minima. It seems possible that some resonance might exist between the volume of the atmosphere and the constriction of the jet streams. The Rossby waves began to show up in the 1980s (Francis and Vavrus, 2015) During the last solar minimum between 2007 and 2009, NASA scientists noticed anomalous shrinkage more than anticipated in the thermosphere, a thick hot layer of atmosphere where satellites orbit. The jet streams, however, are thousands of metres lower, 9,000 - 16,000 m elevation in the atmosphere and well below the thermosphere. The relationship requires further research.

In 2012, it was reported by NASA that global average cloud height had declined by roughly one percent over the decade, decreasing by around 30 to 40 metres. This was mostly the result of fewer clouds forming at the highest altitudes. If these are evidence of a cooler shrinking atmosphere, and it continues to shrink, how will the jet streams behave? NASA scientists have assumed but not proven that carbon dioxide is responsible for the unexplained behaviour. They also concur that water vapour is a very powerful greenhouse gas.

The Seif dunes of the Sahara might be a clue, up to 100 km long and 90 metres high, Seif dunes are far out of equilibrium with modern Sahara wind. Do Seif dunes represent a time during the Ice Ages when very high winds blew for a long time as the Earth's winds were compressed toward the equator? Were these the jet streams of the deeper past? Were jet streams closer to the ground and longer lasting?

Further objective examination of historical weather records and further objective examination from the tree ring record is required.

CONCLUSIONS

Extreme weather events, mostly drought are considered, but floods as well, correspond to solar minima in more than 75% (18 out of 24 of the cases known).

Current concentrations of carbon dioxide cannot be invoked for extreme weather in the historical past.

The sun controls the climate of the Earth.

During summer it is inevitable that lightning storms ignite fires and produce heavy rain. The intensity of what we have come to call extreme weather is magnified by standing Rossby waves.

Sunspot research tends to emphasize sunspot peaks and sunspot numbers; more may be gained by evaluating trough events and peak and trough frequencies.

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