

Rapid Climate Change 11.5 Thousand Years Ago

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Introduction

Human pre-history is shaped by climate changes, genetic mutations, development of ego-consciousness, development of languages and specific eras such as the “Great Leap Forward” (Homo Sapiens moving out of Africa) and the transition from hunting and gathering to “food production”. We should add the catastrophic events including major volcano eruptions to the list.

The rapid climate change 11.5 thousand years ago is the key to many mysteries. If we understand how and why it happened we can make good progress towards solving some of the puzzles in human pre-history. There is a lot of pseudo-scientific literature on the significance of this event. There is also a general tendency towards an explanation in terms of a cataclysm such as a near-collision of a large asteroid with Earth. Compelling evidence for such a cataclysmic event was collected by D.S Alan and J.B. Delair [1]. In this article I will argue, however, that the event 11.5 thousand years ago was the result of a resonance of Earth cycles.

Before I proceed with the details essential to my argument I will merely mention the major climate drivers. Some of these drivers are explained in this article. I hope to expand on the unexplained ones in future articles.

Orbital Forcing:

- a) 41 kyr axial tilt cycle
- b) 100 kyr eccentricity cycle
- c) 100 kyr equatorial plane oscillation with respect to the ecliptic
- d) 23 kyr cycle of the precession of the equinoxes

Solar Forcing:

- a) 11 yr solar cycle
- b) other solar cycles

Cosmic Ray Forcing:

- a) related to heliosphere and magnetosphere shielding b) only the high energy cosmic rays play a role

Geodynamics of Earth's Inner Core and Mantle:

- a) super-rotation and inner-core nutation
 b) super-plumes
 c) subducting plates
 d) volcanoes

Amplifiers:

- a) CO₂
 b) Methane
 c) Water vapor
 d) TPW (true-polar-wander)

The carbon cycle is piggybacking on the water cycle. The CO₂ effect was more important during ice ages.

Clockwise and Counter-clockwise

As seen from above the North Pole, Earth rotates counter-clockwise around its spin axis. Most of us learn this at school. We also know it instinctively because Sun rises from the east. How many of you have learned at school that Earth and other planets revolve around the Sun in the counter-clockwise direction? Very few of us know that Sun rotates around its axis counter-clockwise as well. Sun rotates around its axis 25 times slower than Earth's rotational speed. In other words, Sun's equatorial (sidereal) rotational period is 25 days.

There is one Earth motion, however, that is clockwise as seen from above the North Pole. This motion is known as *Earth's Precession*.

Historical Record in Ice-Cores

Drilling holes and extracting ice-core samples from polar ice caps are among the most difficult research projects. We owe gratitude to those heroic geophysicists. They were able to construct the time-line of the major Earth events. The ice-core samples show the temperature history of Earth going back 250-400 thousand years. The ice-core samples carry a lot of information about the past climates [2] [3].

Ice-core layers with acidic dust give us the dates of the past volcanic eruptions. Mineral dust indicates that during the last ice age the world had been windier. The Greenland ice-cores show that most of the dust carried by wind originated in Asia. The most important property of the ice-core samples is the trapped air bubbles. It took a long time to analyze the trapped air from the bubbles but now scientists know a lot more.

The most important conclusion from these studies is that the climate changes were global. Greenland and Antarctica ice core samples show that climate changes happened at the same time in both hemispheres. The second most important conclusion was that the changes were rapid. There was a rapid global warming 14700 years ago and again 11500 years ago. In both events global temperatures increased about 7 degrees Celsius in

few decades. Between the two warming periods there was a cold period. This mini ice age proceeded with three sudden drops in average temperatures. In the last stage of the mini ice age just before the second global warming 11500 years ago Earth was as cold as it was 20 thousand years ago at the peak of the ice age. This is a reminder that the current global warming may be followed by a cold period. Even though the current amount of CO₂ in the atmosphere is very high and therefore a cooling seems next to impossible there are also strong arguments for a coming ice age. The astronomical cycles are very strong drivers. There are also geophysical mechanisms at the core-mantle boundary that scientists are just beginning to understand that may have huge implications for the climate. Most importantly, the solar energy output has cyclical variations. There are short-term variations superimposed on longer term cycles. In the next 100 years the solar energy output will decrease on average. Contrary to the current view, the probability of a coming ice age is not negligible.

The ice-core samples show that changes in the average temperature was effective in a wide geographical area. The global warming 14.7 kyr (thousand years) ago was dominated by the temperature changes in the tropical areas and the one 11.5 kyr ago was dominated by temperature changes in both tropical and high latitude areas.

11.5 kyr ago the average temperature increased about 7 degrees Celsius, the rainfall increased 50 percent and the winds died down significantly in few decades. More importantly the temperatures did not revert back to the cold days. The temperature fluctuations stopped, the Earth entered the post-glacial warm period (Holocene) which continues to this day. The 40 year transition period, however, must have been difficult for human beings because of the torrential rains and snow storms. It is clear that the “Great Deluge” and other “Flood” memories in mythologies and religion refer to this period. The floods were of different kinds in different parts of the world. In North America the natural dams of ice collapsed and caused total destruction in the surrounding areas. In the Middle East and Egypt there were torrential rains causing flooding in the river basins. In Central Asia there were terrible snow storms. There were mass extinctions of animals and plants all over the world. The ocean levels rose and the coastal areas were flooded by ocean water. Many humans died in either rain or ocean floods all over the world. The hunter-gatherers suffered great food shortages because they could not find animals to hunt. The human population on earth decreased significantly. In this 40 year period genetic mutations took place. Necessity is the mother of invention, the hunter gatherers had to adapt to the new situation and they did.

Following the difficult decades, however, the climate improved and temperate climates emerged. The sudden onset of relative paradise on earth was particularly striking in the Mediterranean area. Following the emergence of the Mediterranean climate the “Neolithic Revolution” (transition to farming) started in the Eastern Mediterranean. Another relative paradise in the period following the global warming 11.5 thousand years ago was the Caucasus area, the land between the Black Sea and the Caspian Sea. The hunter-gatherers of this area invented herding. The transition from hunting and gathering to food production as in farming and herding caused population explosions. The expanding populations from these areas mixed with local hunter-gatherers in all parts of the world for the next 10 thousand years creating new cultures and languages. The population expansions and the migrations of the “Eastern Mediterranean” and the “North Caucasian” tribes can now be traced by their genetic markers.

Major Event 1 Million Years Ago

The scientists studying the ice ages and the climate changes in the distant past discovered that the ice ages on earth are cyclical. There are major and minor cycles. The period of the major cycle is currently 100 thousand years. They also discovered that until about 1 million years ago the ice age cycle period was 41 thousand years

long. Something happened 1 million years ago that caused this change. The 41 kyr period of the past ice ages coincided with the 41 kyr period of the oscillation in Earth's obliquity. I will explain what obliquity is and the logical connection between the obliquity and the temperatures on Earth in the next section.

Astronomical Earth Cycles

The star *Polaris* is known as the *North Star* because it is directly above the current North Pole. The Earth's spin axis directly points to *Polaris*. About 14 kyr ago the Earth's spin axis was pointing to the star *Vega*. About 5000 years ago the *North Star* was *Thuban*.

Vega will be the *North Star* in 12 thousand years and *Polaris* will become the *North Star* again around 27800 AD. This is because the earth's spin axis traces a conical area in space around the rotation axis of the solar system. Earth's spin axis is not perpendicular to the rotational plane of the Solar System but inclined by 23.44 degrees. This motion of the spin axis is similar to the motion of a spinning top and known as *Earth's Precession*. The period of Earth's precession is about 26 kyr (25700 years) which is also known as the *Great Platonic Year*. The 26 thousand year cycle mentioned in mythologies and esoteric traditions is actually the precessional cycle.

The plane on which all planets of the *Solar System* revolve around the Sun (Pluto was an exception but it is no longer considered a planet) is known as the *Plane of the Ecliptic*. The angle between the Earth's equatorial plane and the ecliptic plane is called *obliquity* and currently is 23.44 degrees. This angle is the same as the angle between the Earth's spin axis and the ecliptic axis. The *obliquity* and the *axial tilt* refer to the same thing. The axial tilt causes the seasons as the Earth revolves around the Sun. When the Northern Hemisphere is tilted towards the Sun it receives more solar radiation and experiences summer.

The axial tilt of Earth oscillates between 22.2 and 24.5 degrees with a period of 41 kyr. The axial tilt angle is currently decreasing. This is the main wobble of the precessional rotation. There are other wobbles like the Chandler and Markowitz wobbles. The 41 kyr cycle in obliquity was the main driver of ice ages until 1 million years ago.

The cause of the precession and the wobbles is the bulging of the Earth near the equator. The bulging was originally formed because of Earth's rotation around its axis. The Sun, the Moon and the other planets exert a pull on the Equatorial bulge trying to align the equatorial plane with the Ecliptic plane. Angular momentum created by Earth's rotation around its axis and Earth's revolution around the sun resists these pulls. The result is a complicated motion of the spin axis in space.

Another interesting consequence of the precession is the change in the timing of seasons. Assuming no adjustments made to the calendar, about 11500 years ago the summer in the Northern Hemisphere started in December. In other words, the winter solstice was actually a summer solstice.

The days where we have 12 hours of daylight and 12 hours of darkness are called *equinoxes* (scientific definition is different but let's go with equal night and day definition for simplicity). Currently the Spring Equinox happens around March 20 and the Fall Equinox happens around September 23 in the Northern Hemisphere. About 11500 years ago the "Fall Equinox" was happening in March of the current calendar and the "Spring Equinox" was happening in September of the current calendar. For all practical purposes it was as if the Southern Hemisphere was the Northern Hemisphere. This does not mean the Earth flipped in space. In terms of seasonal

effects it appeared as if it did. The spin rotation was still counter-clockwise; the Sun was still rising from the east.

While Earth's spin axis is rotating clockwise around the solar axis with 26 kyr periodicity the *ellipticity* of Earth's orbit changes with 100 kyr periodicity. The ellipticity changes in such a way that it appears as if the ellipse is rotating counter-clockwise. This motion is known as the “*Precession of the Ellipse*”. Since the main precessional rotation is opposite to the rotation of the ellipse the resulting periodicity which is known as the “*Precession of the Equinoxes*” has the periodicity of 23 kyr. This is why the seasons shift slowly over the years and if the calendar is not adjusted equinoxes shift 6 months every 11500 years. The calendars have been adjusted in the past, we expect calendars will be adjusted again in the future. The latest calendar (Gregorian) was adjusted so that the “Spring Equinox” would happen in April. As we know the “Spring Equinox” is now happening in March. The physical cause of “*Precession of the Ellipse*” is the gravitational pull of the Jupiter and the Saturn. These heavy planets interfere with the pull of the Sun and complicate Earth's orbital motions.

The axial tilt causes seasons because the tilt determines the amount of solar energy deposited per square-meter on a given location on the Earth's surface, especially in locations away from the equator. This quantity is referred to as “*solar insolation*”. The axial tilt and the solar insolation are directly related. If the tilt angle is oscillating with a 41 kyr period than the solar insolation is oscillating with a 41 kyr period as well. There is a theory known as the *Milankovitch Cycles* that studies the changes in solar insolation as a result of precessional motion and related wobbles and connects them to ice ages.

Milankovitch Cycles

The speculations on the connection between Earth's axial motions and the ice ages have been around for more than century. In 1920's and 1930's *Milutin Milankovitch* built on the earlier calculations of *James Croll* to come up with a theory that explained how ice sheets could be formed over centuries as a result of minor variations in solar insolation at the high latitudes. The main idea was that as the snow builds it reflects more sun light amplifying the effects of the decrease in solar insolation. The opposite happens when solar insolation increases, the shrinking ice sheets reflect less sun, more sun light is absorbed by the surface, amplifying the effects of the increasing solar insolation. Since the solar insolation at high latitudes change as a result of the changes in the axial tilt the periodicity of ice ages predicted by the Milankovitch theory is 41 kyr. Milankovitch and his followers also calculated the minor cycles. Minor in the sense that solar insolation would change by a relatively small amount as a result of these astronomical cycles. For example, the Earth's *eccentricity* (ellipticity) changes in a 100 kyr year cycle as mentioned in the previous section.

For many years the Milankovitch theory was controversial because currently the ice ages seem to be happening with a 100 thousand year periodicity and the changes in solar insolation every 100 thousand years as a result of the change in orbital eccentricity (ellipticity) is not enough to explain the temperature variations.

Even with the historical record extracted from the ice cores the controversy continued because the ice core history goes back roughly 400 thousand years (250 kyr in Greenland ice-cores, 420 kyr in Antarctica ice-cores). Another heroic scientific effort took place in the area of deep ocean-cores. The oceanic sediments preserved a historical record that goes back millions of years. After extensive studies of the deep ocean cores and calibration of the dates with independent techniques scientists confirmed that until 1 million years ago the 41 kyr year cycle was the main driver of ice ages. The modern understanding that emerged from these studies is the following: oscillations in solar insolation is just a trigger mechanism. The solar insolation itself is not enough to explain the

amplitude of the changes in temperatures. Scientists also confirm that CO₂ and methane amount in the atmosphere follow the changes in temperatures very closely. CO₂ and Methane are the main drivers of the feedback mechanism. The solar insolation is an input to the climate system. The input is amplified and there are complicated feedback mechanisms. Apparently, 1 million years ago the climate system made a transition to a different state. The cause of this transition is not yet known.

An alternative theory by R.A. Muller and G.J. MacDonald [4] explains the 100 kyr cycle in glaciation by the period of orbital inclination with respect to the “*invariable plane*”. Earth's orbital plane and other planets' orbital planes oscillate relative to each other. The *invariable plane* is practically the orbit of the Jupiter.

A Note on the Ocean Levels

At the peak of the last ice age 20 kyr ago the ocean levels were 120 meters lower than the current level. A huge amount of water was used in the formation of the polar ice sheets. The ice sheets in North America were 2 miles thick. This means that it was easier for modern humans to cross waters between the continents. It was easier to reach Australia. Asia and North America were connected by a land bridge. Europe and North America were connected by thick ocean ice. So, if all ice melted today would the ocean levels be 120 meters higher? **No.** The answer is 70 meters higher than the current levels. The explanation is in timing. Earth entered a warm period starting 15 kyr ago and since then a lot of water was released back to oceans. Also, once the weight of ice sheets were removed the North American and Eurasian continental masses were lifted on the liquid mantle.

Huge Amount of Water in the Mantle

Earth is the only planet in the Solar System with plate tectonics. The continents drift slowly. The plates of the crust (lithosphere) move relative to each other. This is how mountains were formed. This is why earthquakes happen. Scientists talk about fault lines. The fault lines are the lines where the tectonic plates meet and grind against each other. How do the continents drift? They drift because there is water in the lithosphere. We are familiar with this because we know where spring water comes from. Most of us probably do not know, however, that the huge molten rock layer below the lithosphere, the mantle, also contains water. The mantle is 5 percent water. The amount of water in the mantle is roughly equal to the amount of water in the oceans.

Climate Fluctuations in the 100-20 Kyr BP Period

It is very important to mention the climate pattern known as the *Dansgaard-Oeschger Cycles*. This helps us understand what humans were going through while they were roaming Eurasia following animals and surviving as hunter-gatherers. If you examine temperature graphs of the ice core samples from Greenland in the 100-20 kyr BP (before present) range you will see that there were many temperature fluctuations characterized by rapid warming and gradual cooling. This pattern was not prominent in the Southern Hemisphere. These temperature fluctuations and related climate changes in the Northern Hemisphere must have made life very difficult for the hunter-gatherers. During this period humans were preoccupied with survival and did not have the scope for cultural development.

Special Phase 11.5 Kyr Ago

11.5 thousand years ago the obliquity (axial tilt) was at maximum. Since then the tilt angle has been decreasing. 11.5 thousand years ago the summer solstice in the Northern Hemisphere was happening near the *perihelion*.

This is a very rare configuration. Earth has an elliptical orbit and the position on the orbit where Earth is closest to the Sun is called *perihelion*. Today we experience summer near the *aphelion* when the Earth is farthest from the sun. In 11.5 thousand years summer solstice will be occurring near the perihelion again. This follows the 23 kyr cycle of the precession of the equinoxes.

When the axial tilt is at maximum the seasonal contrasts are at maximum too. A larger tilt angle means the summer hemisphere will receive more solar radiation while the winter hemisphere will receive less. 11.5 kyr ago the summers were much warmer and winters were much colder than today because of the maximum tilt angle. If summers are experienced near the perihelion the summers will be even warmer because the summer hemisphere will be closer to the sun. When the two effects are combined like it happened 11.5 kyr ago the summers will be extremely hot and the winters will be extremely cold.

As we have seen before the axial tilt also changes the solar insolation in the higher latitudes. 11.5 kyr ago the June solar insolation at latitudes higher than 40 degrees in the Northern Hemisphere were at maximum and significantly higher than today. The solar insolation is a bigger factor in the Northern Hemisphere because there are more land masses (continents) in the Northern hemisphere. Land temperatures respond to changes in solar insolation quicker compared to oceans. The special astronomical configuration 11.5 kyr ago had stronger consequences in the Northern hemisphere.

The current understanding in Climatology is that higher temperatures cause CO₂ and Methane gases to be released into the atmosphere. These extreme summers must have caused an increase in CO₂ and methane levels globally. We also know that CO₂ and methane are the key components of the feedback mechanism controlling the average global temperature. The feedback mechanism amplifies the effects of solar insolation changes. The special astronomical configuration 11.5 kyr ago contributed to the rapid climate change.

True-Polar-Wander as Amplifier

There was another climate amplifier. The rapid climate change 11.5 thousand years ago most probably resulted in a true-polar-wander. This is a very interesting subject. Please see my article titled "[Past and Future Pole Shifts](#)" for details. In a true-polar-wander the rotational axis of Earth remains fixed in celestial coordinates but a new equator is formed due to changes in the mass density distribution of Earth. This results in the change of coordinates relative to the rotational axis. The true-polar-wander occurred in the past numerous times and will occur in the future. Large earthquakes and volcano eruptions cause small (few centimeters) shifts. The current global warming combined with other geophysical effects may result in a large true-polar-wander in this century.

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[3] PNAS Collection of Articles on Ice-cores: http://www.pnas.org/cgi/collection/rapid_climate

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good info and related to RMP Vital Vastness

After I read VV again, I started thinking about what he implied but left unsaid. He refers to a natural occurrence of rings, spirals, and 90 degree angles. He also wrote briefly about human's latent abilities. He states the static electricity of all life help to energize the Earth's fissioning core.

Thinking past this, I conjecture that the initial crisis of the Earth, the first extinction was due to a polar relocation of 90 degrees, which would have been from perpendicular through the equatorial land masses grouped primarily on the equator ending approximately at the 30-40 degree north and south latitudes. With the poles stable, vertical, and Earth in a circular orbit, bliss reigned or so the examination of the Cretaceous shows.

My theory is that we roved out of a high-energy cloud (which the Russians propose we have now again roved) and humanity became a victim of the ionizing particles of the Earth's core. The weakened fields (see RMP Vital Vastness) allowed CME and flares to penetrate the Earth and further provoke ionizing events, the first and second extinctions of life on Earth.

All life now in existence are mutations provoked by ionizing radiation.

To propose how the magnetic field came to be 24.5 degrees off, I think the first extinction was so powerful the field changed from vertically bisecting the equatorial continental masses and became vertically aligned through them. The Earth would have proceeded to split itself to attain a stable continental distribution of podal/antipodal positions. To explain why the poles moved off vertical alignment of continental I propose a solution proven only by evidence: the Schumann resonance collectors and their builders, the Pyramid people. They build Schumann collectors on the then equatorial region stretching from East to West and created the largest standing wave they could. The reason would have been to restore the previous 90 degree angle.

11/18/2010

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They failed but the failure can be seen today in the Cayman Trench, over 300 miles long and 3 miles deep, erasing one of the collectors. The poles moved but only the 24.5 degrees we see today.

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