Did outburst of Supermassive Black Hole Sagittarius A cause an extreme glaciation on earth
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Abstract

A new theory (Tao, The Origin of Abyssal Rivers, the Grand Canyon and Man, 2018) (Tao, Did outburst of Supermassive Black Hole Sagittarius A cause an extreme glaciation on earth, 2018) is emerging that suggests our planet earth went through a radical climate change during the late Miocene before Pliocene from 5.6 to 5.33 million years ago (MYA), with an initial cooling starting 5.9 MYA, then an extreme cooling at 5.6 MYA and its abrupt ending at 5.33 MYA, resulting in a most extensive glaciation event “Miocene Glacier” since the dinosaur’s era. This previously unidentified late Miocene Glacier has been suggested to cause an unprecedented ocean receding with the ocean depth dropping by 2 miles (3500 to 4000 meters) and all continental lands covered with 4 miles thick ice sheets on average, except for around the equator. The outburst of Supermassive Black Hole Sagittarius A ca 6MYA emerges as one of the leading causes.

The theory of Miocene Glacier 5.33 – 5.6 MYA

The theory of “Miocene Glacier” was first hypothesized by Thomas Tao, the author, as the origin of vast submarine canyons and abyssal rivers found miles deep at ocean bottoms, nevertheless it has been suggested to be the cause of many significant geological phenomenon such as the Grand Canyon, the
Ogallala formation, the Monument Valley in the North America and biological extinctions and emergences of new species during 5.9 to 5.33 MYA such as the split of Chimpanzees leading to the rise of human race (Tao, The Origin of Abyssal Rivers, the Grand Canyon and Man, 2018).

Based on modeling, at the height of the Glacier Miocene, half of the ocean water became ice sheets on the lands. The earth surface was covered by 1/3 oceans/seas, 1/3 newly formed land once under sea and 1/3 existing continental land mass largely covered by ice sheets. The ocean surface temperatures were assumed to be similar to or slightly warmer than today’s however the continental lands were at 20-35 °C colder due to the adiabatic cooling of 2 miles in the ocean level receding.

The glacier was abruptly ended at 5.33 MYA resulting in a biblical flash flood worldwide.
The concept of the Miocene Glacier was radical but feasible within the Laws of Physics. For example, modeling indicated that our own Sun has sufficient irradiance energy to evaporate half of ocean water in a few hundred years, and ice sheets during the Miocene Glacier can extend to 4 or 8 miles thick, remaining as solid not liquefied when temperature on lands dropped below -15 °C by the adiabatic cooling.

Geological events that support the theory of Miocene Glacier were extensive. For example, an abyssal river found 2 miles deep in the Northwest Pacific Ocean bottom, the Cascadia Channel (Griggs, 1969) was dated to be 5.0 to 5.8 MYA by examining the age of ocean rocks as shown in the USGS Magnetic Strips of the ages of ocean crust (USGS, 1999). Also those unnamed abyssal rivers off Moresby Island near the Juan De Fuca Fault in the Northwest Pacific Ocean were determined to be of the same age of the Cascadia Channel 5.0 to 5.8 MYA. Thus these abyssal rivers found 2 miles deep on the ocean bottom of the Pacific North West implied the glaciation occurred during 5.0 to 5.8 MYA.

Nevertheless the sea level drop by more than 2 miles had been known. The Mediterranean Sea had been known to be partially or completely dried up, leaving its sea level dropped by more than 2 miles within 1,000 years at 5.6 MYA (Clauzon, 1996), the event was known as the Messinian Salinity Crisis. The Mediterranean Sea was abruptly refilled at 5.33 MYA and this rapid return of ocean water was also known as the Zanclean Flood (Marco Roveri, 2008). The Messinian Salinity Crisis and the Zanclean Flood were suggested to be the consequences of the Miocene Glacier.

Vast salt formations at the end of Miocene prior to 5.33 MYA at then ocean bottoms had been well documented and these salts can be found globally in the Red Sea (Peter Stoffers, 1974), the Mediterranean
Sea and the Sigsbee Escarpment in the Gulf of Mexico (Jackson, 2004). These sea bottom salts were massive and extensive and they were all buried under sediments of early Pliocene 5.33 MYA. Nevertheless the interpretations of these salt formations had been historically attributed to otherwise, for example, the Sigsbee salts in the gulf of Mexico were said to be formed via salt tectonics of old Louann salts of Jurassic era. Today these late Miocene salts were suggested to be remnants of much broad salt formations at then dried up Miocene ocean bottoms during the Glacier Miocene.

The Grand Canyon (Karl E. Karlstrom, 2014) and the Ogallala formation were known to be formed 5-6 MYA, coincidently a perfect match with the theorized Miocene Glacier. It was suggested the biblical flash flood, a sudden melting of glacier ice sheets at the end of the Miocene Glacier 5.33 MYA shaped all these iconic landmarks in the North America and worldwide.

Yet the most compelling evidences of the Miocene Glacier were those vast submarine canyons and abyssal rivers found on the continental shelves/slopes or on sea floors. As the modeling indicated, the Miocene Glacier, an Alpine glacier, advanced or retreated only on the continental shelves/slopes when the seasons alternated, not on the continental lands though. The data indicated that the ice sheets on the continental lands had been locked in a permeant frozen state due to the adiabatic cooling when the sea level dropped by 2 miles, and they were largely stationary, unlike any known glaciers during the ice age. The modeling further suggested that the Miocene Glacier left little telltale marks of rounded or polished rocks or debris we have associated with Continental Glaciers. These Miocene ice sheets had nevertheless carved vast submarine canyons on the continental shelves/slopes under sea, as shown off the coast of Delaware USA.

Many biological and evolulational events and facts were suggested to be linked to the Miocene Glacier. Author has presented an evolutionary trend (Tao, The Origin of Abyssal Rivers, the Grand Canyon and Man, 2018) in that the event of Miocene Glacier favored grazers who consumed ground level vegetation such as grasses, and suppressed browsers who ate tree leaves, due to the glacier was expected to wipe out trees on continental lands, but grasses flourished on newly formed lands formerly under sea. Well known examples were horses, Deinotherium a prehistoric animal that resembled the modern day elephant, Giant Ground Sloth, Mammoth and the rise of Man - species depend on trees went extinct, and species depend on grasses flourished or were formed.

Nevertheless a thorny issue has been that why people did not know about the Miocene Glacier before? Author (Tao, The Origin of Abyssal Rivers, the Grand Canyon and Man, 2018) reasoned its uniqueness covered up its presence:

- **Little glaciation marks were formed or left on continental lands.** The modeling indicated the Miocene Glacier was an Alpine glacier, extensively covering all continental lands but it was not a Continental Glacier found in the Ice Age. The edges of the Miocene glacier ice sheets rested on
the continental shelf/slopes under seas, not on the continental lands with little advancement or retreating of ice sheets on the continent lands when seasons alternated. Without mechanical abrasions or erosions induced by movement of the ice sheets, there simply were no or little rounded rocks to be found on the continental lands;

- *Glaciation marks were extensive and everywhere on the continental shelf/slopes* – in the form of vast submarine canyons, and indirectly on the sea floors – in the form of abyssal rivers or channels. *But they were deep under sea* and they have hardly been explored;
- The *biblical flash flood* at the end of Miocene Glacier 5.33 MYA wiped out shallow glaciation marks on lands if they ever existed. But the flood left vast scars on the continental lands, with landmarks such as the Grand Canyon, nevertheless they were not glaciation marks.

**The outburst of Sagittarius A and the Miocene Glacier**

Yet what had caused this extreme climate change of the “Miocene Glacier” during 5.6 to 5.33 MYA remains to be resolved. Among many possibilities the cosmic ray outburst from the supermassive black hole in the center of our own milky way, Sagittarius A (J. Bland-Hawthorn, 2013) (Pau Amaro-Seoane, March 13, 2018) (Rongmon Bordoloi, 2017), ca 6 MYA, emerges as the leading candidate (Tao, Did outburst of Supermassive Black Hole Sagittarius A cause an extreme glaciation on earth, 2018).

The timing of Sagittarius A outburst coincides with the newly identified late Miocene Glacier. The outburst is known to be extremely powerful and our solar system as expected should have been impacted by the blast of cosmic rays forcefully, for example its X-ray was projected to outshine our own sun in our solar system. And researchers from University of Kansas and NASA suggested that ionizing cosmic rays induced cooling or glaciation on earth, to be the potential cause of glaciation in Ordovician 440 MYA that resulted in mass extinctions, though lately some had questioned NO2 formed in earth’s atmosphere might not sufficient to trigger a global glaciation.

Yet many urge questions must be answered before we draw a conclusion linking the cosmic event with the theorized Miocene Glacier, and these important questions include but not limit to:

- The precise time and the duration or the length of the Sagittarius A outburst;
- The energy profiles and the ionizing particle distributions (including photons such as gamma rays) of the outburst;
- When these energetic particles (including gamma rays, alpha, beta and gamma particles, muons, etc.) reached earth and what were their flux intensities, did they reach earth as waves at different times as implied by the cooling events in the Miocene Glacier?
- Comprehensive mechanism of ionizing particles induced cooling or glaciation on earth;
- Verification of the late Miocene Glacier

Nevertheless if proven to be true the theorized event of the late Miocene Glacier and the outburst of Sagittarius A may emerge to be the most important breakthrough of connecting cosmic rays with climate changes found on earth. Author strongly encourages researchers to scrutinize these new findings and more importantly to participate in resolving these unresolved yet pressing issues.

**Discussions of glacier formation and ionizing particles induced precipitation**

A glacier is formed when snow precipitation exceeds its melting,

snow precipitation > snow melting => glaciation
either increased snow precipitation or decreased snow melting will lead to glaciation. The snow melting is largely influenced by surface temperatures, for example, global warming via greenhouse gases, etc. would increase the snow melting.

During the Miocene Glacier half of the today’s ocean water (0.63 billion cubic kilometers) had presumably been evaporated and transported and stored on land as ice sheets, and the glaciation might reach its apex rapid within 1,000 years at 5.6 MYA as evidenced by the Mediterranean Sea (Clauzon, 1996) when its sea level receded by more than 2 miles within 1,000 years. Thus the evaporation rate of the half ocean water had to be prompt and it would need to absorb a gigantic amount of energy, a minimum of $1.4 \times 10^{27}$ joules that only warm oceans not cold seas were able to sustain, and that energy was ultimately provided by our Sun. (Tao, The Origin of Abyssal Rivers, the Grand Canyon and Man, 2018). The initiation of the glaciation requires warm oceans to provide sufficient moistures and we would expect a global cooling of oceans can’t trigger the extensive Miocene Glacier.

Therefore one would argue that the climate cooling with the decreased snow melting could not be the key factor that initiated the Miocene Glacier. Thus the climate changes or cooling caused by NO$_2$ or ozone likely would have nothing to do with the Miocene Glacier.

The increased (snow) precipitation on continental lands was the only feasibility for the glaciation. One would argue that likely the increased snow precipitation on the continental lands initiated the glaciation while oceans remained warm all the time.

Indeed modeling suggests the increased snow precipitation. Our modeling indicated that during the Miocene Glacier oceans or seas would remain warm, a few degrees °C warmer than today’s oceans, while the continental lands were getting colder, up to 20 – 35 °C colder than today’s primarily due to the adiabatic cooling when the ocean level receded by 2 miles.

Thus we can reason that the Miocene Glacier would be initiated by the increased snow precipitation on the continental lands.

So what had caused the increased (snow) precipitation on the continental lands 5.33 – 5.6 MYA?

Cloud seeding has been frequently used in many countries, especially in China, today to increase local precipitations. Rockets loaded with seeding crystals such as dry ices were launched into clouds to induce local rain falls. Cloud seeding may not increase the global precipitation but will increase the local amount of rains where the seeding occurs.

Cloud seeding by ionizing particles was proposed as the leading mechanism of the increased snow precipitation in high latitude areas. High energy ionizing particles were known extremely effective in seeding or condensation of water vapor. In the original Wilson Cloud Chamber, an alpha particle (MeV), a positively charged helium ion He$^+$, from Uranium Decay left a water condensation trail visible to naked eyes of about 20 cm long with 0.2 cm in diameter. Thus we can estimate how many water molecules being condensed by a single alpha particle (MeV), $7 \times 10^{18}$. For comparison one single alpha particle (MeV) would induce formation of $10^6$ NO$_2$ mole-
cules, much lower, at 12 orders of magnitude, than water condensation. This gives us a good reason to say NO₂ or ozone or any greenhouse gases less likely being responsible for the formation of the Miocene Glacier, except for water.

Our own earth’s magnetic field will channel or concentrate charged particles from cosmic rays (and solar winds) toward poles or the high latitudes. One would argue that in the high latitudes and colder areas especially in the Northern Hemisphere of Asia, Europe and North America shall receive increased precipitations when an outburst from cosmic rays (and solar winds) reached earth. Unfortunately there were far few scientific publications exploring the correlation of cosmic rays with precipitations found on earth, and one exception was the discussion of high speed solar wind stream that was attributed to increased lightning rates, or triggered thunderstorms in central England (Scott, May 14th, 2014).

We clearly need more studies or research data to find out that the outburst of Supermassive Black Hole Sagittarius A ca 6MYA caused the increased snow precipitation leading to the formation of the Miocene Glacier 5.33 – 5.6 MYA.

Nevertheless we can simplify and make an estimate of a threshold of the flux \( F_{\text{min, cloud}} \) (\( \#/\text{sec} \cdot \text{cm}^2 \)) of ionizing particles in the cosmic rays formed during the outburst that had reached earth at the cloud level (up to 2 miles above ground) at somewhere 40 - 70 degrees of the Latitude, that might trigger the Miocene Glacier. The flux threshold at the cloud level was estimated as,

\[
F_{\text{min, cloud}} = 10 \text{ He}^+ \text{ ions/sec.cm}^2
\]

assuming the glaciation and the ocean receding maximized within 1,000 years.

Even though the estimate seems a little too simplified it implies that at the cloud level up to 2 miles above ground at latitudes of 40 – 70 degree, such as at the tops of Mt. Pyrenees in France and Mt. Washington in New Hampshire USA, when the flux of ionizing particles \( F \) exceeded a threshold of 10 \( \text{He}^+ \text{ ions/sec.cm}^2 \) for 1,000 years, it would trigger excess snow falls leading to an extreme glaciation. Some of key assumptions and terms used in calculation are described below:

- Flux of ionizing particles (\( \# \text{He}^+ \text{ ions/sec.cm}^2 \)), an equivalent of alpha particle \( \text{He}^+ \) (MeV), since they consist of different particles and energy distributions
- At 40 - 70 degrees of Latitude of the Northern Hemisphere EuroAsia or NorthAmerica, where initially heavy snow precipitation was expected
- Glaciation or Ocean receding occurred in 1,000 years
- \# of water molecules condensed per an alpha particle (MeV), \( 7 \times 10^{18} \)
- Volume of water being condensed as ice sheets, 0.63 billion cubic kilometers
- Only 10% ocean water evaporated and condensed formed ice sheets on lands

Similarly if the glaciation took a little longer than 1,000 years, for example in 10,000 years or in 100,000 years, the thresholds or the fluxes of ionizing particles \( F_{\text{min, cloud}} \) would be 1 or 0.1 \( \text{He}^+ \text{ ions/sec.cm}^2 \) respectively.
Earth’s atmosphere will absorb much of ionizing particles and their flux $F$ at the cloud level is much smaller than at the out edge of the earth’s atmosphere. For example the flux of ionizing particles at the top of Mt. (French) Pyrenees (elevation of 2867 meters) were recorded less than 0.1 ions/sec.cm$^2$ most time, which is obviously not sufficient to trigger excess snow snow falls.

But had the outburst of the Supermassive Black Hole Sagittarius A caused an increased flux of ionizing particles at the cloud levels such as at the tops of Mt. Pyrenees in France and Mt. Washington in New Hamshire USA to reach 10 He$^+$ ions/sec.cm$^2$ for 1,000 years? Or to reach 1 He$^+$ ions/sec.cm$^2$ for 10,000 years? Or to reach 0.1 He$^+$ ions/sec.cm$^2$ for 100,000 years?

If the answer is “yes” to any one question above, then we are on the right path to resolve this greatest mystery of the outburst and the Miocene Glacier – that ionizing particles in cosmic rays from the outburst of Sagittarius A ca 6 MYA caused increased snow precipitation in high latitude areas that further initialized the glaciation of the Miocene Glacier.

References


