CLIMATE CHANGE DRIVEN BY WEAKENED MAGNETIC FIELD, OZONE THINNING & INCREASED ULTRAVIOLET RADIATION --- NOT DUE TO GREENHOUSE GASES & INFRARED RADIATION

Richard F. Cronin, BChE, MBA, P.E (ret.), American Geophysical Union, Geochemical Society, Caesar Rodney Institute, August 30, 2026, E-mail: richard.f.cronin@gmail.com

AUTHOR INTRODUCTION: Retired and Independent researcher. Entire career in the private sector. No employment in academia nor government service. BChE Chemical Engineering Univ. of Detroit-Mercy 1973, MBA Univ. of Delaware 1980, Professional Engineer (non-practicing). Member American Geophysical Union and Geochemical Society. Forty (40) years experience in industrial commodity chemical processes, much as Earth's geochemical processes. Thirty three (33) years with E.I. DuPont de Nemours in Process Engineering, Design, and Project Engineering leadership. This paper is entirely my own based upon my engineering education, experience, literature search, and logical deduction. I have received no funding for this work.

ABSTRACT – On a global average, the Earth's magnetic field has weakened approx. 9 to 10 % over the last 160 to 200 years. Most notable is the teardrop-shaped South Atlantic Anomaly (SAA), centered due east of Porto Alegre, Brazil, but extending from South Africa to the waters of the eastern Pacific. Magnetic field strength in this region is measured at 22 micro-Teslas and lower. The weakened magnetic field allows greater solar proton penetration into the lower layers of the ionosphere, formation of HOx, NO, and NOx, ozone destruction and increased Ultraviolet (UV) radiation to the surface. Moreover, the Dalton Minimum, with negligible solar activity, spanned from 1790 to 1830. We have enjoyed sustained Solar Cycles since then. Solar Maximum # 25 (2024 to 2026) has been particularly powerful. Thus, continuous Forbush Decreases have also contributed to ozone reduction, reduced cloud cover, brighter skies and greater Ultraviolet radiation reaching the surface.

Earth's most recent magnetic field breakdown was the Laschamps Excursion, 41000 to 42000 years ago, triggering a near collapse of Earth's protective ozone layer and bathed the planet in Ultraviolet (UV) radiation. The magnetic dipole broke apart and magnetic anomalies (weak points) wandered across the Earth. This led to dramatic climate change, violent weather, and the final great migration of Homo Sapiens out of Africa. UV radiation evaporated water from the Southern Oceans and delivered snows across the far northern latitudes to build the Ice Age glaciers. In fact, conditions across southern Europe were mostly cool and Alpine. Africans sought out shelter in the limestone caves of Eurasia to escape the extreme UV. Armed with bow and arrow, Homo Sapiens evicted cave bears and Neanderthals. Hunting and fishing was conducted at night. Humans who ventured out in daylight "covered their nakedness" and applied red ochre clay on exposed limbs and faces as sun block. With minimum exposure to daytime radiation and Ultraviolet, Eurasians develop paler skin (lower melanin) in order to produce adequate Vitamin D.

This paper will discuss in greater detail the role of magnetic field variations, ozone destruction, UV radiation increases, warming of the Southern oceans, and degassing of dissolved CO2. Multiple papers have disputed the claims of Anthropogenic Global Warming / Climate Change -- allegedly due to "greenhouse gases" and "downwelling" or "back scatter" of Infrared radiation. I will leave that discussion to others.

DEDICATIONS - To the most special people in my life, Judy Cronin, love of my life, now departed, and our sons Steven and Robert.

FUNDING – I have received no outside compensation for this work. This work is entirely my own.

AUTHOR AFFILIATIONS – No affiliations. Semi-retired private consultant and lecturer.

ETHICS DECLARATION – I have no ethical conflicts nor outside influences in this work.

I. DISCUSSION

On a global average, the Earth's magnetic field has weakened approx. 9 to 10 % over the last 160 to 200 years (1). The geomagnetic field has been decaying at a rate of ~5% per century from at least 1840, with indirect observation suggesting a decay since 1600 or even earlier (2). Thus the solar wind, solar proton showers from solar activity (Coronal Mass Ejections - CMEs), and high energy Van Allen protons penetrate as deep as the D layer of the ionosphere (50 to 90 km up), producing Nitric Oxides (NO & NOx) (5) which precipitate to the ozone layer (15 to 35 km up), destroying ozone (5, 6, 7, 8) and allowing greater Ultraviolet radiation to penetrate to the surface.

Gases in our atmosphere, including water vapor and CO2, do not absorb Ultraviolet radiation. Also, aerosol droplets of water in white clouds plus white ice fields do not absorb Ultraviolet radiation. Rather, white clouds and white ice fields present reflective albedo for Ultraviolet. Ultraviolet is totally absorbed on opaque surfaces — green/blue ocean surface, forests, cropland, grey/brown/red stone, human skin and bodies of algae or photosynthetic life. There are other astrophysical, geographical, and geomagnetic effects that drive variations in Ultraviolet radiation absorbed on Earth's surface, such as Milankovitch Cycles (Obliquity, Orbital Eccentricity, Precession of Equinoxes) plus the greater distribution of continental land masses in the Northern Hemisphere which foster clouds and ice fields, thus reflecting Ultraviolet. Two thirds of continental lands are in the Northern Hemisphere.

A photon on the Ultraviolet spectrum carries 30X the Energy of a photon on the Infrared spectrum, thus Ultraviolet radiation is the most powerful band of solar energy received by the planet's surface. UV-C (200 to 280 nanometers) is blocked above 50 km. Only UV-A (315 to 400 nanometers) and some UV-B (280 to 315 nanometers) radiation penetrate the ozone layer (15 to 35 km up). UV-B and UV-A are the only bands of ionizing radiation to reach the surface. 90% of Ultraviolet radiation is absorbed in the top 10 meters of the oceans.

Infrared radiation is also absorbed by the oceans, but only within the top few micrometers of the surface. The warm water then re-radiates a photon on the Infrared spectrum within one ten thousandths of a second. This absorption and re-radiation occurs in the thermal skin layer, preventing infrared radiation from directly heating the upper layers of the ocean. "Downwelling" Infrared radiation has no net heat accumulation in the ocean waters.

Two thirds of the continental land masses are in the Northern Hemisphere. Therefore, lands of the Northern Hemisphere have greater fog, mist, cloud cover, rain and precipitation, particularly in coastal regions. Clouds and ice fields reflect ultraviolet (albedo). The Southern Hemisphere also has greater UV exposure due to the South Atlantic magnetic field Anomaly (SAA) (Image A) and the Van Allen belt orientation favoring the Southern Hemisphere. Finally, the summer months and longest days of the Southern Hemisphere are when the Earth is at its closest approach to the Sun (Solstice = Dec. 21, Perihelion = Jan. 4). Thus the solar wind's impact is strongest during the Southern Hemisphere's summer, so ozone destruction and UV exposure is greatest in the Southern Hemisphere's summer. This increase in Ultraviolet radiation has heated the oceans of the Southern Hemisphere. Of course, the oceans drive our weather and our climate.

Ultraviolet radiation warms the ocean waters, particularly the South Atlantic, due to the South Atlantic magnetic field Anomaly where the magnetic field strength drops to 22 micro-Teslas (Image A). The modern South Atlantic Anomaly started forming as a distinct low-intensity feature around 1840 AD, though geological studies show that similar recurring anomalies have naturally appeared and disappeared in the region for millions of years (4). Reconstructions show that low-intensity Southern Hemisphere anomalies have recurred over centuries and millennia, with the current iteration emerging after the year 1100 in the Indian Ocean, before crossing Africa and expanding westward. The SAA has grown by approximately half the area of Europe since 2014 (2).

Notably, the South Atlantic Anomaly extends over the Eastern Pacific (Image A) and logically contributes to warming of these waters. Meteorologists describe a developing "Super El Nino" in 2026 as the waters of the eastern and central Pacific have warmed significantly.

The South Atlantic gyre is the only major oceanic surface current that delivers highly heated water towards the Equator, with pockets of ocean water off the Amazon ranging as high as 37 to 40 C. The warmer ocean waters degas dissolved CO2 (Henry's Law). Elsewhere in the world, the magnetic field strength varies from 30 to 65 micro-Teslas, but through ages these anomalies have wandered. The magnetic field is strongest at the poles and weakest around the Equator. Strong magnetic anomalies have been observed in Siberia as well as a region between Australia and East Antarctica. (Image A)

The distribution of Ultraviolet radiation is readily observable in the darker, melanin-rich skin of the indigenous people of the Southern Hemisphere – the Australian aborigine, the Maori of New Zealand, Pacific Islanders, Incas and the native peoples of the Andes, Peru, Bolivia, and Chile as well as sub-Equatorial Africans.

The oceans contain 39,000 gigatons of CO2. Warm waters in the tropics, especially the South Atlantic gyre, degas 90 gigatons each year (Henry's Law). The dissolved gas content is replenished by aeration in the cold stormy waters of the North Pacific and North Atlantic. Human activity contributes 40 gigatons annually. From a quarter to half of Earth's vegetated lands has shown significant greening over the last 35 years largely due to rising levels of atmospheric carbon dioxide, plus warmth and precipitation (9).

Ice cores taken in both Antarctica and Greenland consistently show that the increase in atmospheric CO2 lags the increase in air temperatures, by a matter of months (10). The principal source of increasing CO2 is warmer ocean waters.

The Dalton Minimum, with minimum solar activity, spanned from 1790 to approx. 1830. This was the very end of the Little Ice Age. Damp, cloudy and cool conditions persisted across the Northern Hemisphere. Since then, the Solar Cycle and sustained Solar Activity has continued, with Forbush Decreases (Image C) maintaining clearer skies and ample UV radiation as the norm.

II. PHOTOELECTRIC EFFECT

The great heat transport agent of Earth's biome is water vapor and aerosol water droplets in clouds. The great heat storage reservoirs are Earth's oceans. Published in 2024 by researchers from MIT, the "photomolecular effect" (11) is an entirely new mechanism to evaporate water without thermal input. The peak sensitivity of this phenomenon is the wavelength of the color Green, at 520 nanometers. This finding may also solve an 80-year-old mystery in climate science. Measurements of how clouds absorb sunlight have often shown that they are absorbing more sunlight than conventional physics dictates possible. In summary, the fact that the oceans and biomass cover the Earth in the color Green and the planet is "greening up" (9) assures more coolant is provided for the Earth's evaporative cooling cycle (Water Cycle).

III. LASCHAMPS EXCURSION

The Laschamps Excursion (11,12) was a temporary pole reversal. Occurring approximately 41,000 to 42,000 years ago, Earth's magnetic field weakened further to about 5% - 10% of its modern value allowing the magnetic poles to completely flip to the opposite hemisphere. The magnetic dipole separated and several magnetic anomalies wandered the planet. This reversal state lasted for a few hundred years before the poles flipped back to their original orientation.

During the Laschamps Excursion, Homo Sapiens departed Africa to take shelter in the caves and forests of Eurasia to escape the punishing Ultraviolet radiation due to the loss of magnetic field protection and ozone destruction. Equatorial regions and the Southern Hemisphere were arid and inhospitable. A vast desert circled the Equator.

With the magnetic field operating at just 5% of its normal strength, the planet was left entirely exposed to space weather. Humans "covered their nakedness" and red ochre clays were used as Sun block. Near complete avoidance of Ultraviolet exposure led to Eurasians evolving paler skin as a means to more efficiently produce Vitamin D. Humans dwelled in the caves and forests. They took to hunting and fishing at night, setting snares for small game and fowl.

- Ozone Layer Collapse: Solar winds and cosmic rays stripped the stratosphere, destroying much of the ozone layer and bombarding the surface with extreme ultraviolet (UV) radiation.
- Apocalyptic Weather: The sudden atmospheric changes triggered violent weather, massive electrical storms, and a surge in ice sheets and glaciers across the Northern Hemisphere.
- Shifting Auroras: The northern and southern lights were no longer confined to the poles. Dazzling, erratic auroras warped across equatorial and tropical skies.
- Megafauna Extinctions: The intense climate shifts and radiation are linked to the extinction of several large animal species, particularly in Australia.
- The Fate of Humans vs. Neanderthals. The Laschamps excursion coincided with a major evolutionary turning point: the rapid decline and final disappearance of Neanderthals.

IV. ICE AGE GLACIERS

All Ice Ages were spurred by UV warming the oceans, driving evaporation, and continuous snows along higher latitudes of the Northern Hemisphere. Sea levels fell and glaciers advanced. As glaciers plowed forward, rock and soil consolidated the advancing face. This is called an ice dam

Then as the continuous snows abated, skies cleared, and visible light reached the surface, mats of green glacial algae and primitive multi-color life forms sprouted on the interior of glaciers (15), leading to UV absorption and melt water lakes, contained by the ice dam. As this melt accumulation advanced, the face of the ice dam weakened until it failed catastrophically. Such was the case of Lake Agassiz, the "sixth Great Lake" spanning southern Manitoba, Saskatchewan, Alberta, the Dakotas, and Montana — approximately the volume of the current Black Sea (14). The collapse of Lake Agassiz contributed to the formation of the Great Salt Lake, the Colorado River & Grand Canyon, and the Columbia River basin. Lake Agassiz also flowed out through the Hudson Bay. Lake Agassiz's final major drainage occurred around 8,200 years ago, with an estimated 0.8 to 2.8 m (2.6 to 9.2 ft) rise in global sea levels from this event.

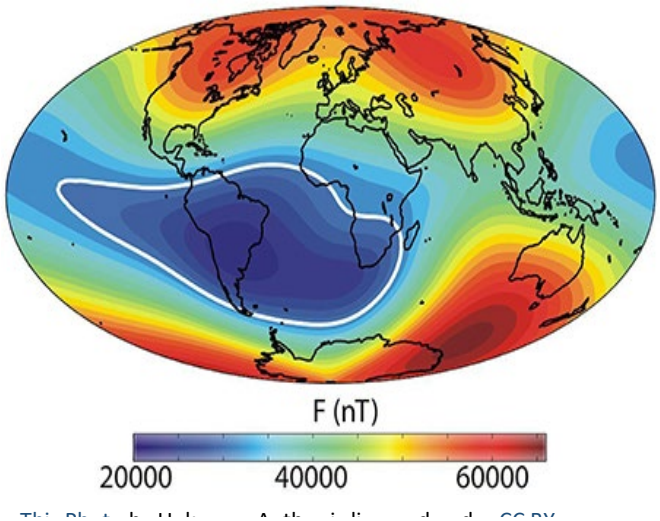
Formation of the Bosporus Strait is postulated that the Bosporus Strait was founded around 7600 years ago when the rising water of the Mediterranean Sea and the Sea of Marmara breached through to the Black Sea, which at that time according to the Hypothesis was a low-level body of freshwater lakes. Again, the volume of Lake Agassiz and the Black Sea is nominally equal.

V. FORMATION OF THE MOON, EARTH'S OBLIQUITY, & LARGE LOW SHEAR VELOCITY PROVINCES (LLSVPs)

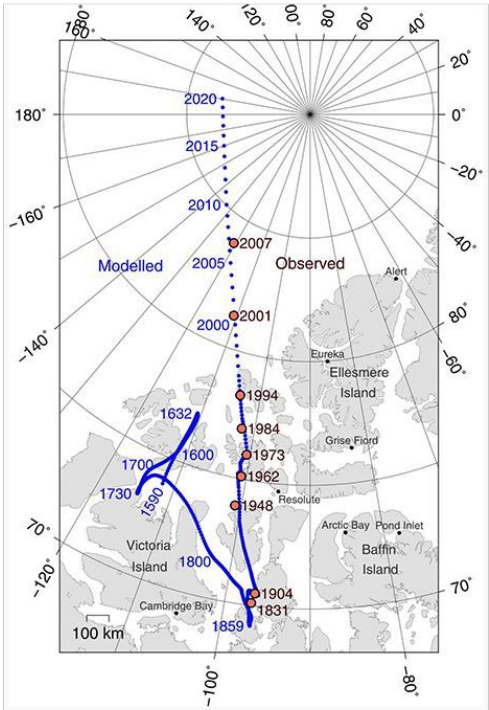
Shortly following the ignition of our Sun and the loss of our gas/liquid proto-atmosphere the Earth entered the Hadean Period. The Earth was a hot, semi-molten mass. Astrophysicists posit that the Earth was then struck obliquely by a Mars-sized celestial object in the "Big Splash" or "Big Impact" (16). This impact imparted Earth's tilt, or Obliquity which provides our seasons as well as the greatest exposure to the solar wind and solar proton showers during the Perihelion (Jan. 4) and Southern Hemisphere's Summer Solstice (Dec. 21).

The impact point was roughly in the North Pacific and two (2) Large Low Shear Velocity Provinces (LLSVPs) were injected into the Earth (17, 18). The third remnant joined with material of the Earth to form our moon. One of the LLSVPs remains beneath the North Pacific. It is named "Jason" in honor of geophysicist W. Jason Morgan. The other LLSVP ended at the Core-Mantle Boundary (CMB), beneath Africa and the eastern South Atlantic. It is named "Tuzo" in honor of geophysicist John Tuzo Wilson. As an ultradense thermochemical pile, Tuzo acts at a thermal blanket. It accounts for how heat escapes from the outer core unevenly. This affects the fluid movement of the molten Iron/Nickel outer core and thus affects the Earth's magnetic field (19). This LLSVP at the CMB is posited as the source of the South Atlantic Anomaly (SAA).

IMAGES



A. South Atlantic Anomaly (magnetic field strength 22 micro-Teslas). Magnetic field also weakening in Northern Canada and strong anomalies are growing in northern Siberia as well as in the region between Australia and East Antarctica.



Historical positions of Earth's North Magnetic Pole, where the direction of the magnetic field is vertical. The pole is currently moving toward Siberia at 34 miles per year. Red circles mark North Magnetic Pole positions as determined by direct observation; blue circles mark positions modeled using the GUFM model (1590–1890) and the IGRF-12 model (1900–2020). *Credit: Cavit (CC BY 4.0 [https://creativecommons.org/licenses/by/4.0])*

B. Migration of Magnetic North Pole into Siberian waters, 1948 to 2020. Magnetic field weakened in northern Canada and significantly strengthened in Siberia. Magnetic North Pole is now in Siberian waters.

IMAGES

C. Forbush Decrease – Solar proton showers from Coronal Mass Ejections and other solar activity can penetrate the Earth's magnetic field to drive ozone depletion and even reach into the troposphere to reduce cloud cover. Observe the difference in cloud cover between the 1972 Apollo Mission showing Solar Cycle #20. Solar activity was on the decline, headed towards a Solar Minimum in 1976. Cloud cover remained intact. Significant cloud cover decrease was noted in the photo from the 2026 Artemis II mission. The loss of ozone and tropospheric cloud cover was caused by the intense Solar Activity of Solar Maximum # 25 (2024 thru 2026). Clear bright skies and ample Ultraviolet radiation was noted in the spring and summer of 2026.

REFERENCES

1. "Core field changes from eleven years of *Swarm* satellite observations". C.C. Findlay, et al. Physics of the Earth and Planetary Interiors. November 2025

2. "Earth's magnetic field is probably not reversing" M. Brown, et al, PNAS, April 30, 2018.

3. "A giant weak spot in Earth's magnetic field is now half the size of Europe" European Space Agency, Science Direct, February 25, 2026.

4. "Intensity of the Earth's magnetic field: Evidence for a Mid-Paleozoic dipole low" L.M.A. Hawkins, et al, University of Liverpool, PNAS, August 17, 2021 (New Evidence for a 200 Million Year Cycle for Earth's Magnetic Field)

5. "Complex analysis of the atmospheric-ionospheric system response to solar versus geomagnetic disturbances", Andrey Mironov, et al, St. Petersburg State University, Journal of Atmospheric & Solar-Terrestrial Physics, August, 2026.

6. "Global ozone loss following extreme solar proton storms based on the July 2012 coronal mass ejection", Niilo Kalakoski, et al , Finnish Meteorological Institute, Nature – Scientific Reports, August 24, 2023

7. "A Violent Sun affects the Earth's Ozone", C. Jackman, et al, NASA Earth Observatory , August 3, 2001

8. "Importance of Solar Protons in Ozone Depletion", Judy Stephenson & Malcolm Scourfield, Space Physics Research Institute, University of Natal, published in Nature, July 11, 1991.

9. "Carbon Dioxide Fertilization is Greening Earth study finds", K.B. Hille, NASA, April 26, 2019.

10. "The Phase Relation between atmospheric Carbon Dioxide and Global Temperature", O. Humlum, K. Stordahl, et al, Global and Planetary Change, January 2013.

11. "How Light can evaporate Water without the need for Heat", C.R. Soderberg et al, MIT News, Apr. 23, 2024

12. "Wandering of the Auroral Oval 41,000 years ago" Agnit Mukhopadhyay, et al, Science Advances, April 16, 2025. (Plain text explanation > "Geoscopy.com" and "Michigan News", University of Michigan)

13. "A Global Environmental Crisis 42,000 years ago" A. Cooper, C.S.M. Turney, et al, publ. Science, Feb., 2021

14. "Black Sea outflow response to Holocene Melt Water Events", J.O. Herrle, J. Bollmann, et al, Institute of Geoscience, Goethe University, Scientific Reports, March 16, 2018

15. "Glacier Algae, A Dark Past and a Darker Future", C.J. Williamson, K.A. Cameron, et al, publ. Frontiers of Microbiology, April 3, 2019.

16. “Where did the Moon come from ?” E. Belbruno, J.R. Gott, Princeton University, The Astronomical Journal, November 18, 2004.

17. “Thermally Dominated Deep Mantle LLSVPs: A Review” , D.R. Davies, S, Goes, et al, The Earth’s Heterogeneous Mantle, Book Series, Springer Geophysics, January 1, 2015.

18. “From Subduction to LLSVP: The Core-Mantle Boundary Heterogeneities Across the North Atlantic”, An Fan, Xinlei Sun, et al, Chinese Academy of Sciences, American Geophysical Union Research Article, Oct. 10, 2021

19. “Origin of the LLSVPs at the base of the mantle is a consequence of plate tectonics – A petrological and geochemical perspective” , Y. Niu, Durham University, Geoscience Frontiers, September, 2018