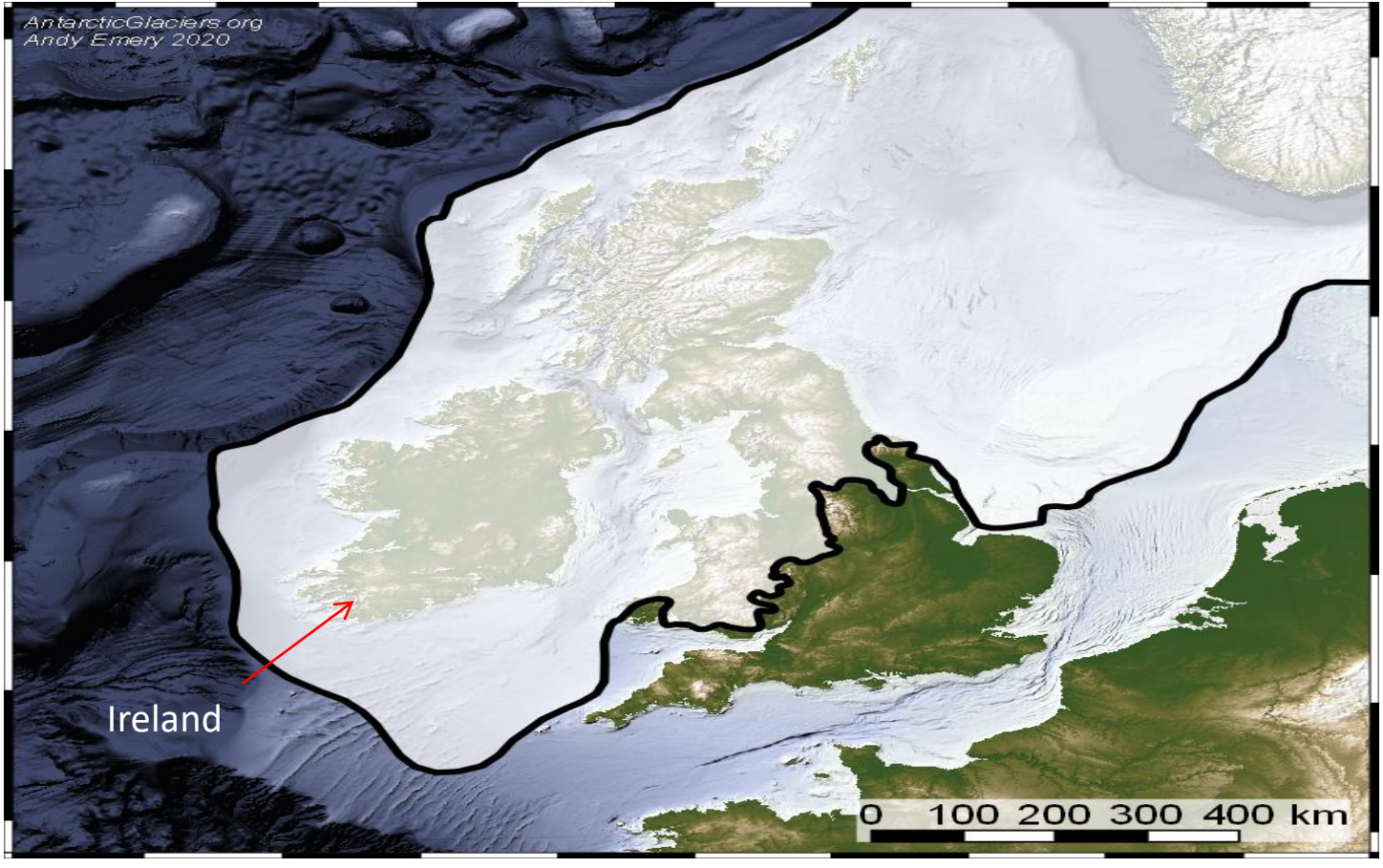
LESSONS FROM PALEOCLIMATOLOGY – Conveniently Ignored By The IPCC

April 20, 2022

ICSF Irish Climate Science Forum

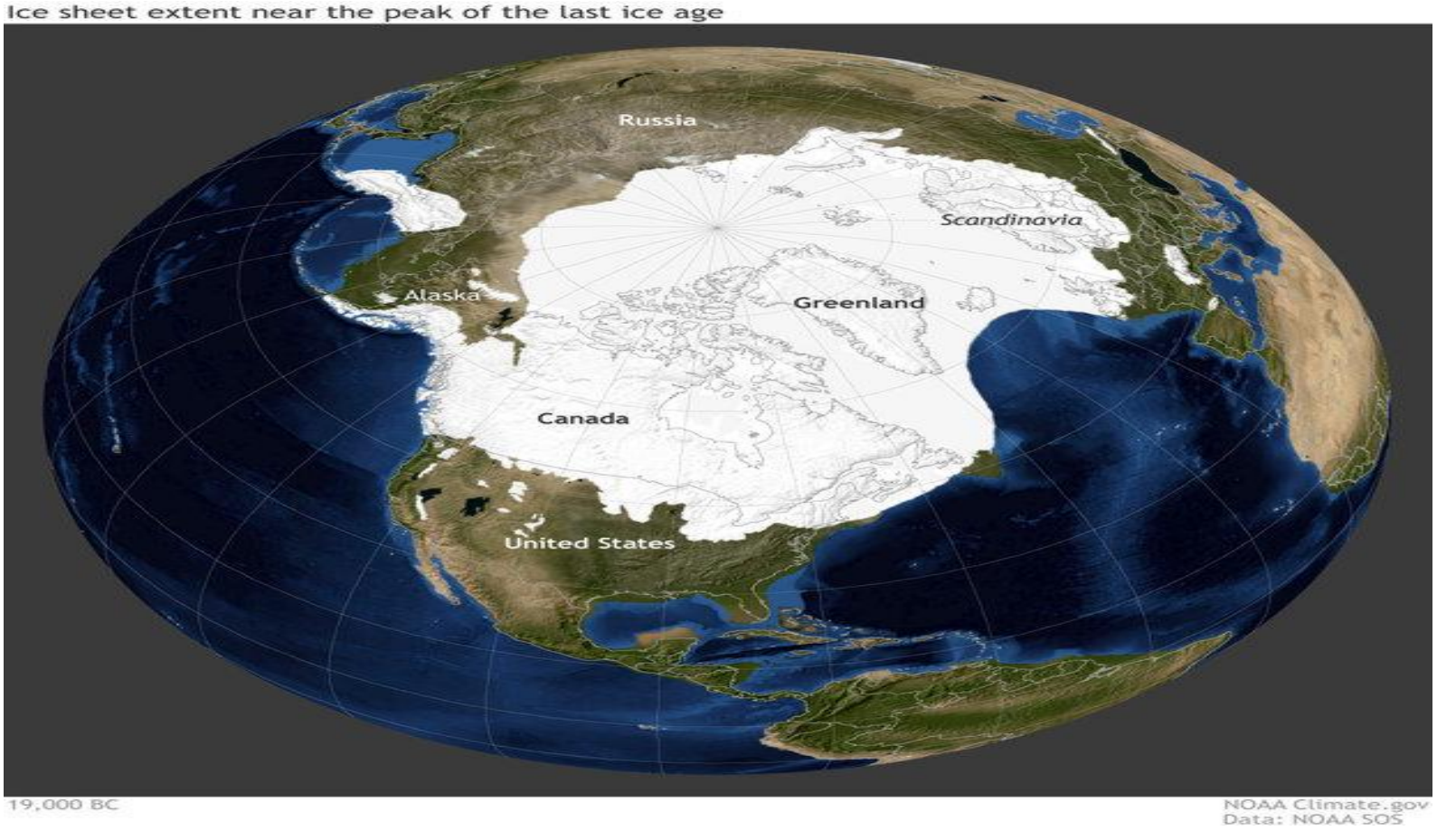
CLintel

Ireland Beneath The Ice 20,000 Years Ago



Antarctic Glacier .org

Northern Hemisphere Glaciers During The Last Ice Age



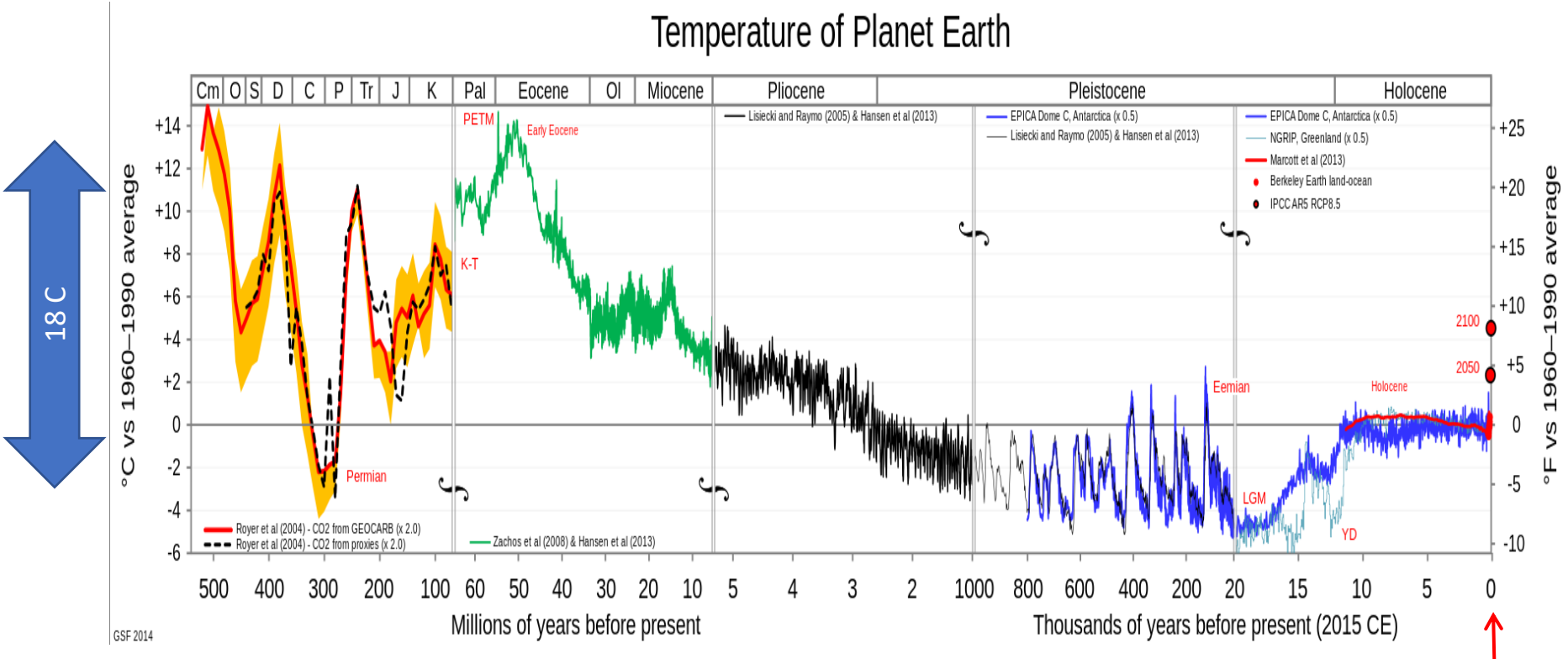
19,000 years ago

NOAA

SETTING THE SCENE

- **Climate Change** (*not weather*!)
- **Variations In Incoming Solar Energy** (Milankovitch and other cycles)
- **Energy Storage** (mechanisms and lags)
- **Energy Transport** (Ocean Currents, Continental Drift)
- **Time** (the past 67 million years and further)
- **Data**: Proxies, Fossils, Isotopes vs Theory
- **The Past** as a Key to the Present, and Perhaps the Trends of the Future

Earth's Temperature Proxy vs. Time (*compressed*)

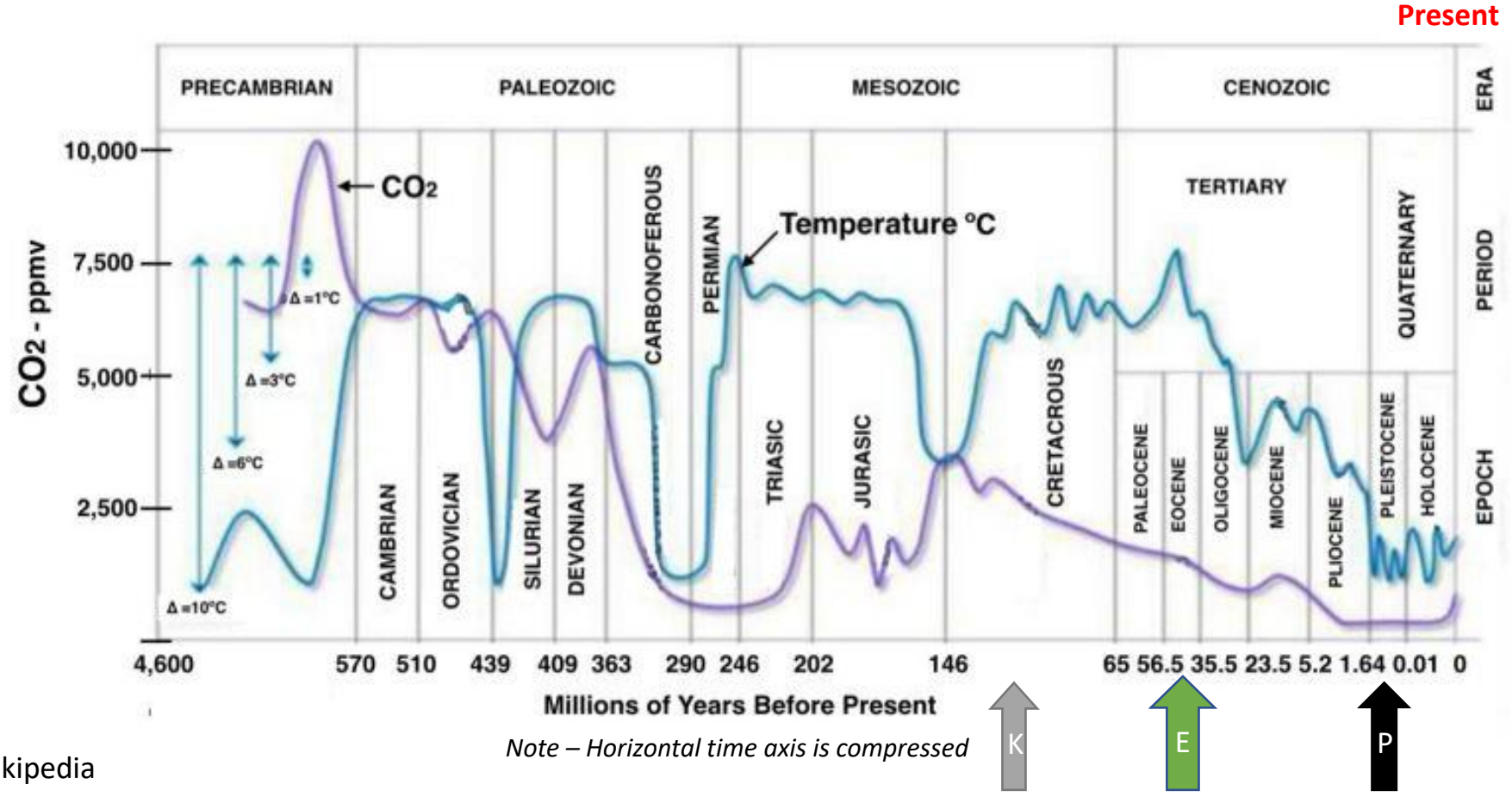


Note – Horizontal time axis is compressed, and has scale changes

Wikimedia

Present

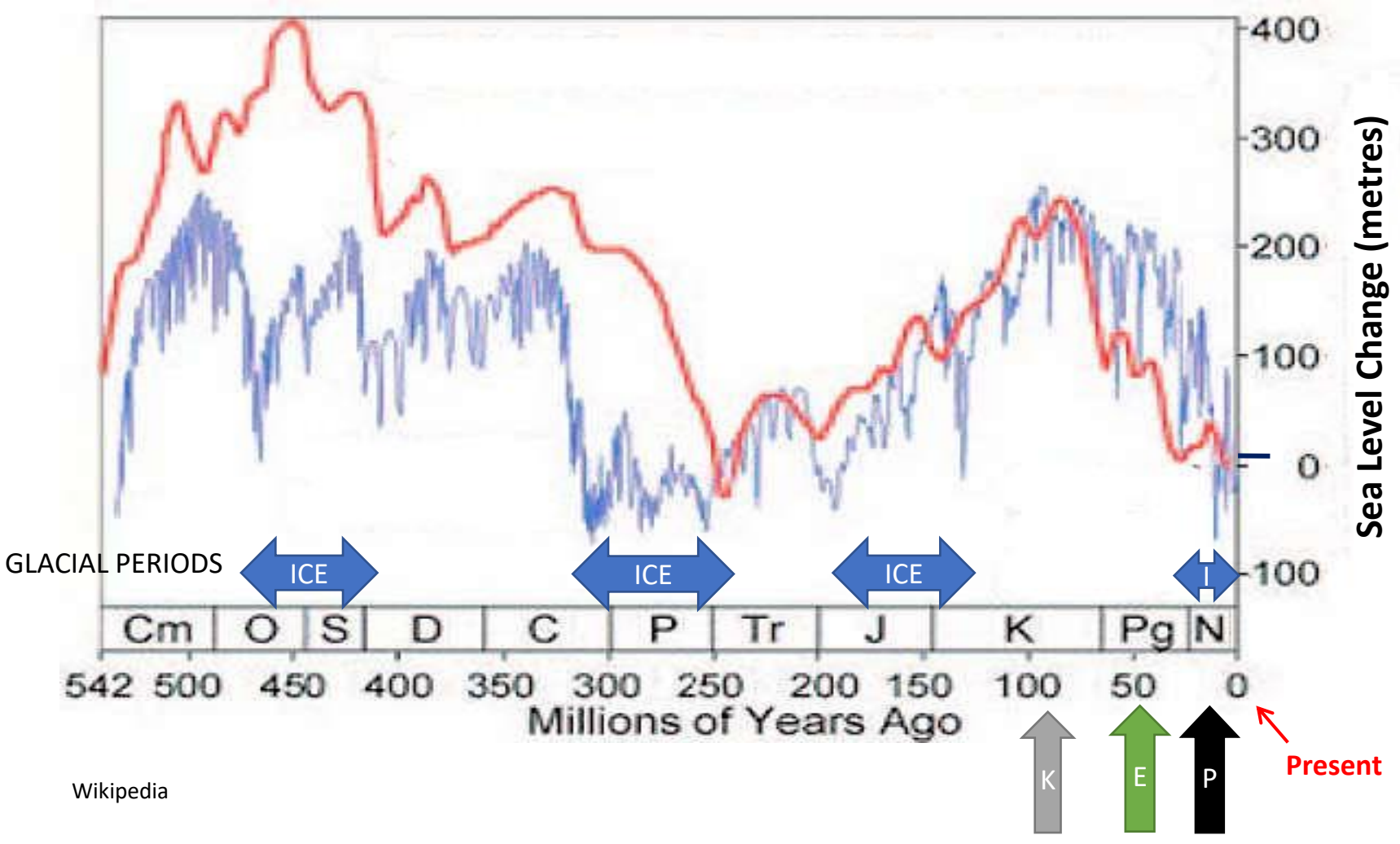
Temperature And Atmospheric CO_2 Over Earth's History



Note – Horizontal time axis is compressed

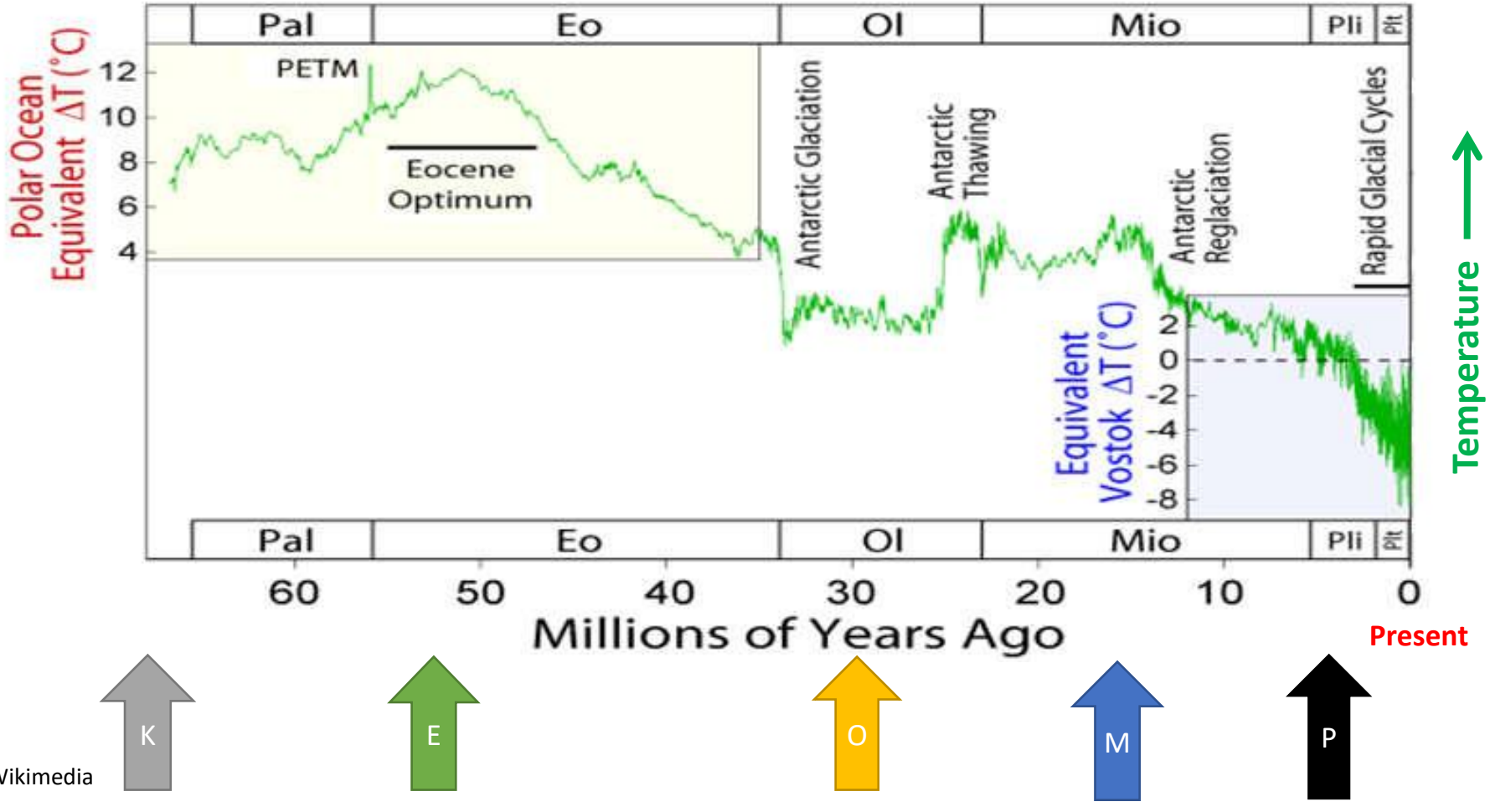
Wikipedia

SEA Level and Glacial Periods in GeoHistory



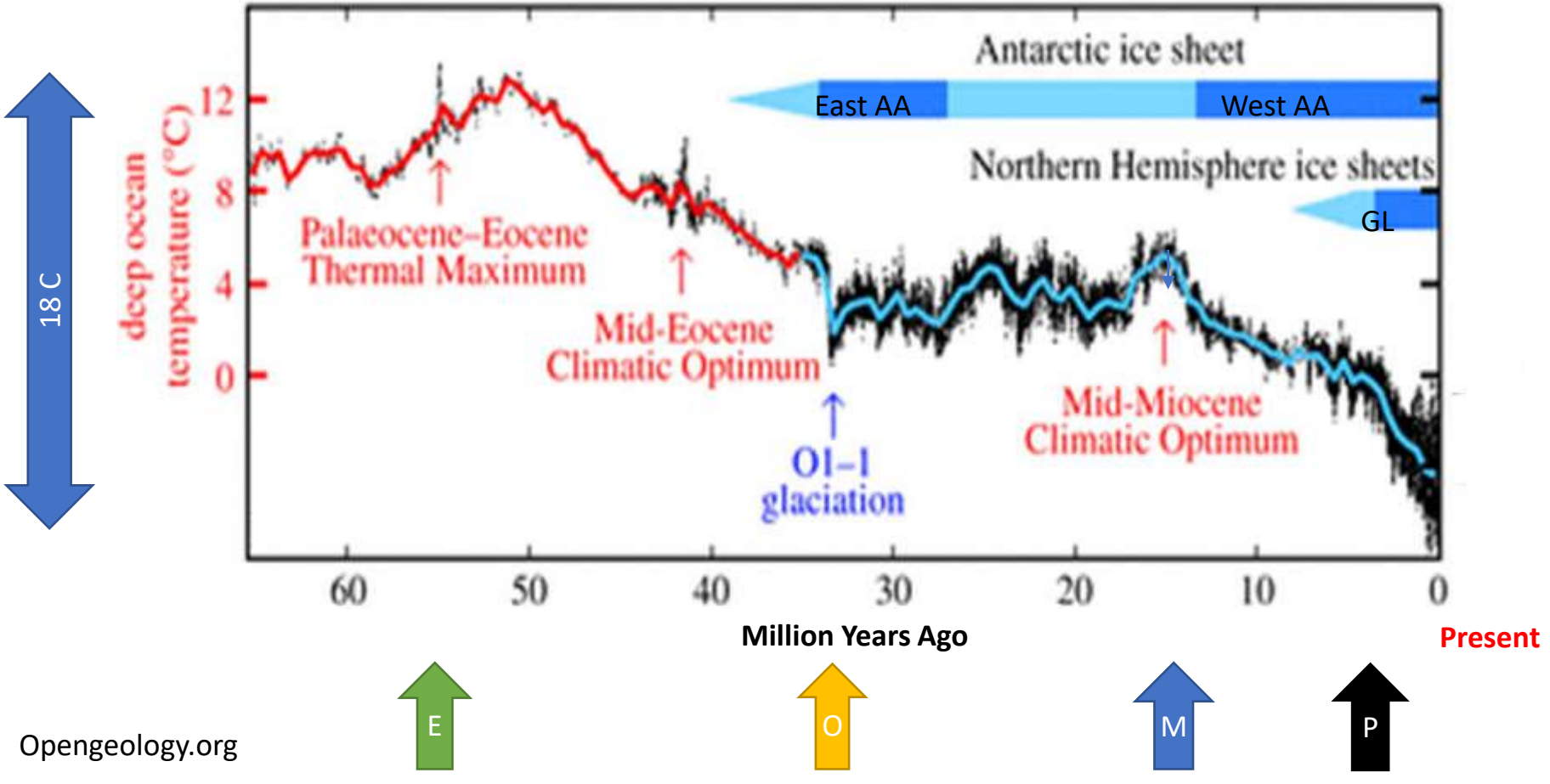
Wikipedia

Earth Temperature Proxies Since the Dinosaur Extinction



Wikimedia

Glaciations During The Past 34 Million Years

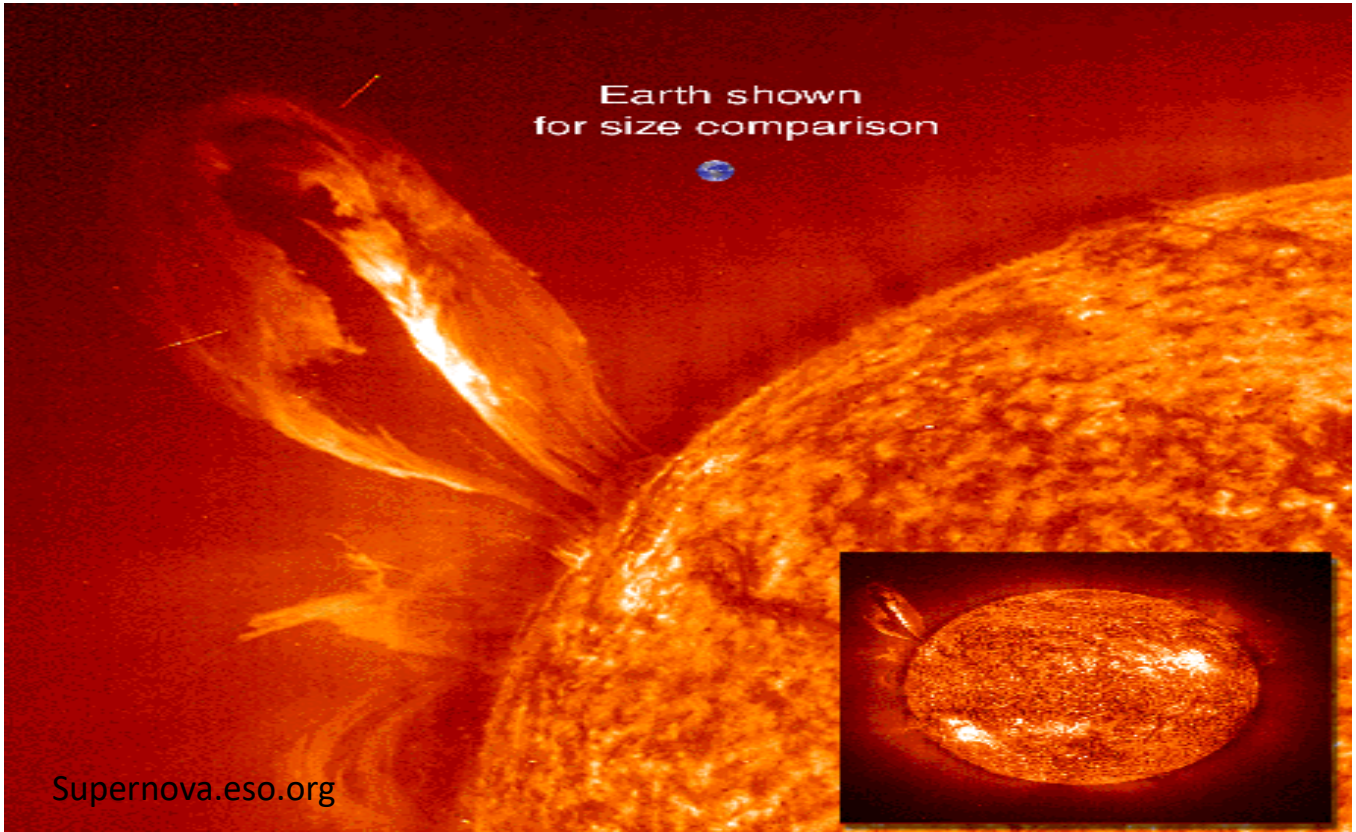


What has caused this dramatic fall in temperature?

- **Solar**
- **Ocean Energy Storage**
- **Ocean Currents**
- **Continental Drift**

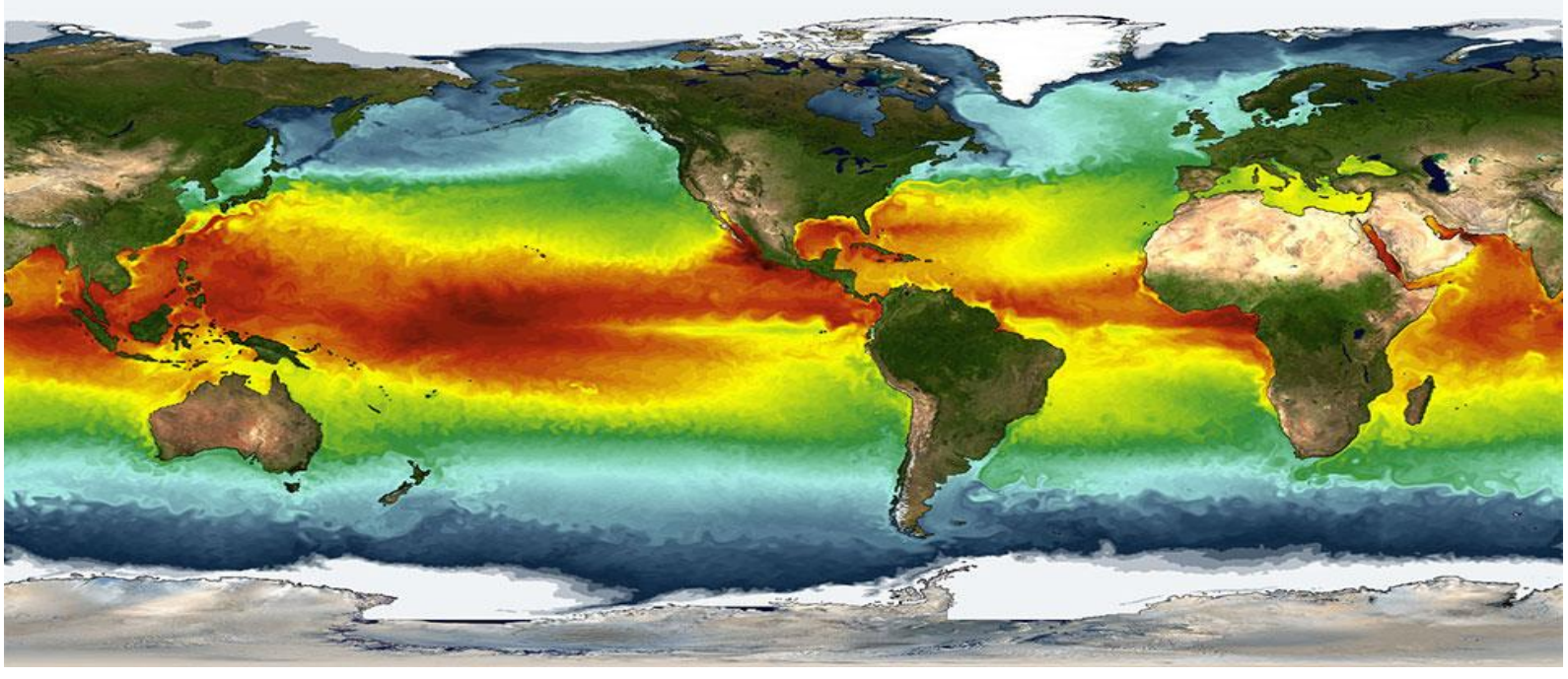
SOLAR

The Sun: is the primary energy source for climate.



The Sun: is the primary energy source for climate.

Oceans: the primary energy "storage" mechanism.

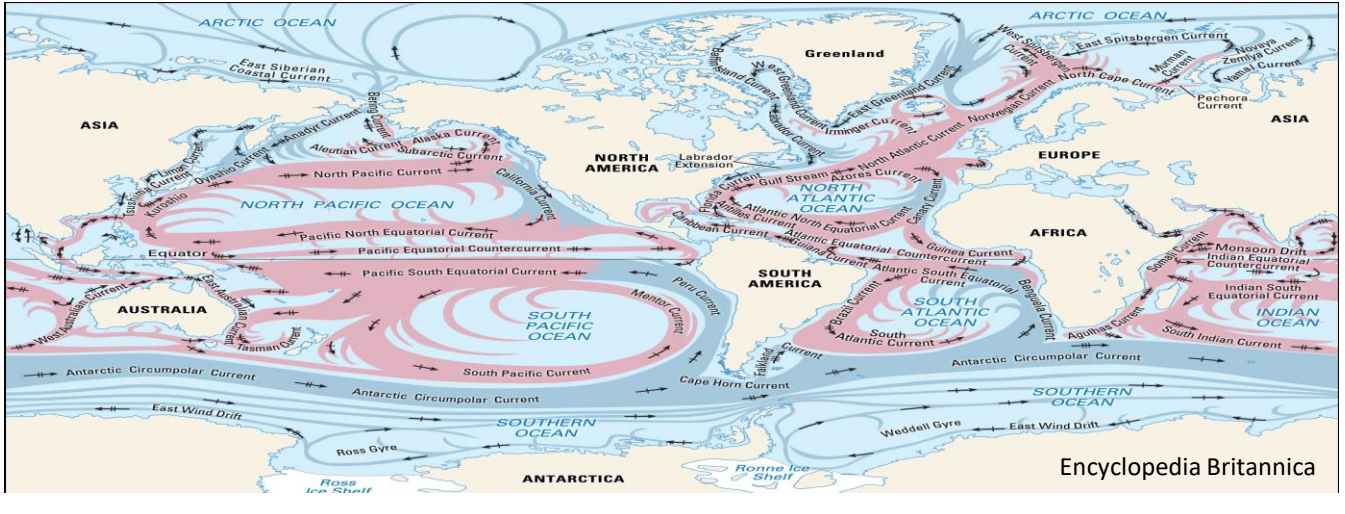


NOAA

The Sun: is the primary energy source for climate.

Oceans: the primary energy “storage” mechanism.

Ocean Currents: the primary energy “transport” and “collection” vehicle.



Encyclopedia Britannica

The Sun: is the primary energy source for climate.

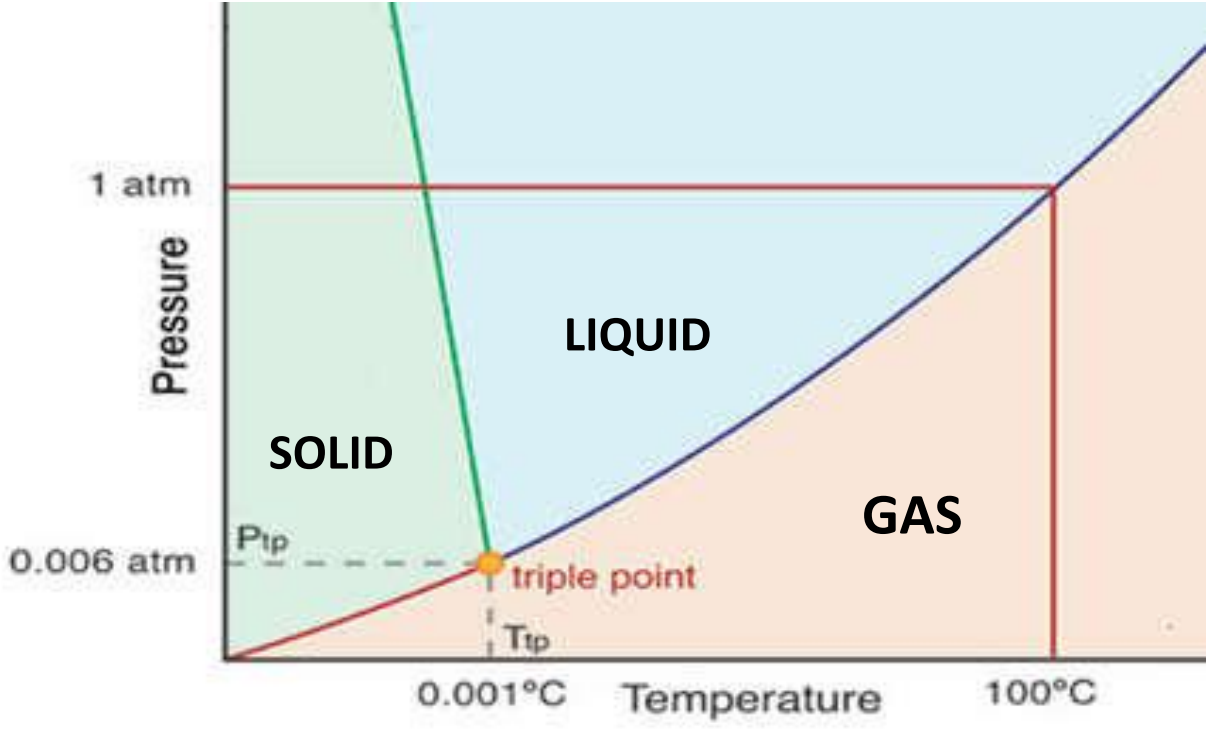
Oceans: the primary energy “storage” mechanism.

Ocean Currents: the primary energy “transport” and “collection” vehicle.

The atmosphere: has a negligible capacity to store long term climate energy.

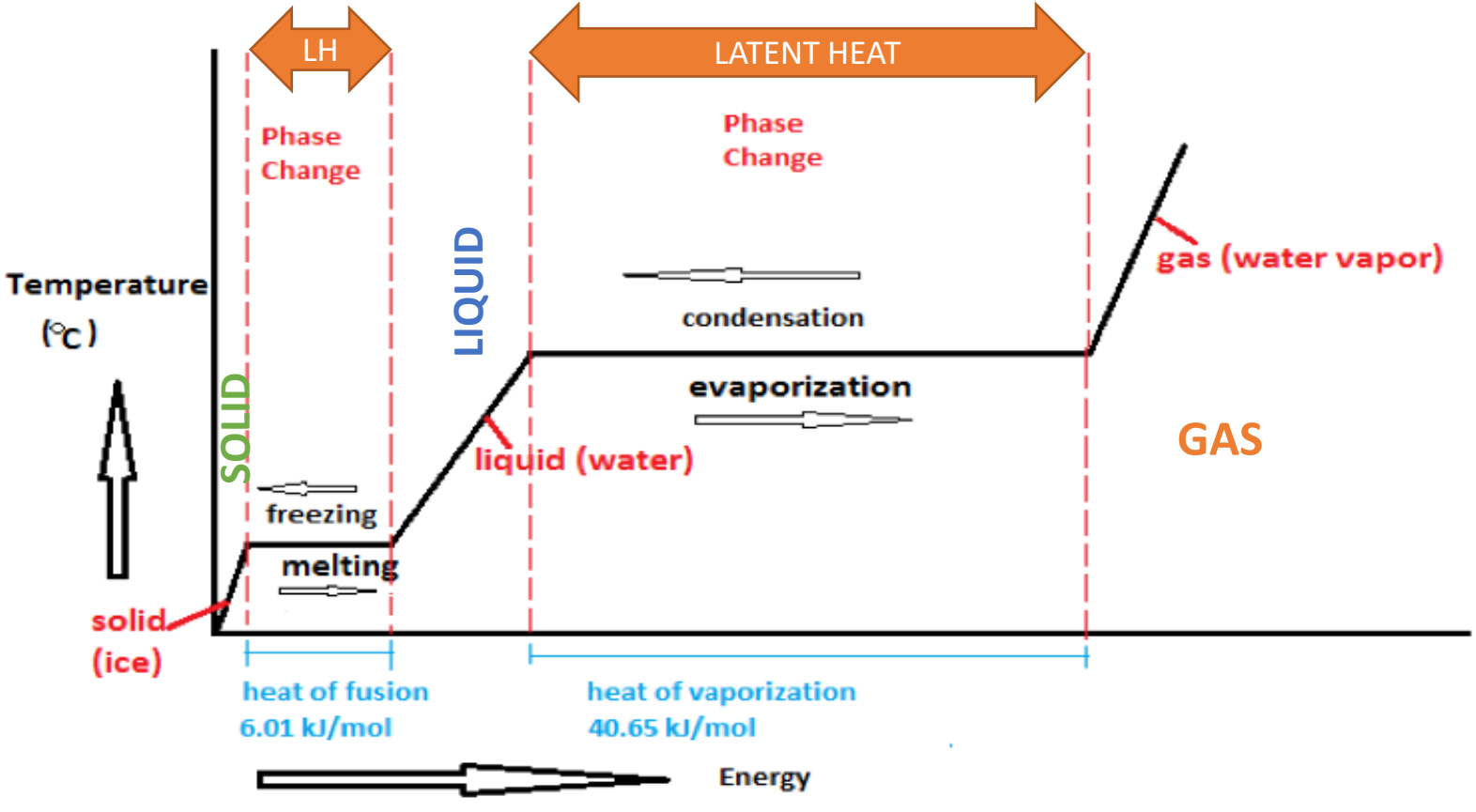
Pratik Shukla (Nightingale)

Water Can Exist In All Three Phases (a unique Greenhouse Gas)



QUORA.ORG

As Water Changes Temperature And Phase, Sensible Heat and Latent Heat Are Absorbed Or Released



Quora.org

Changes To Ocean Currents

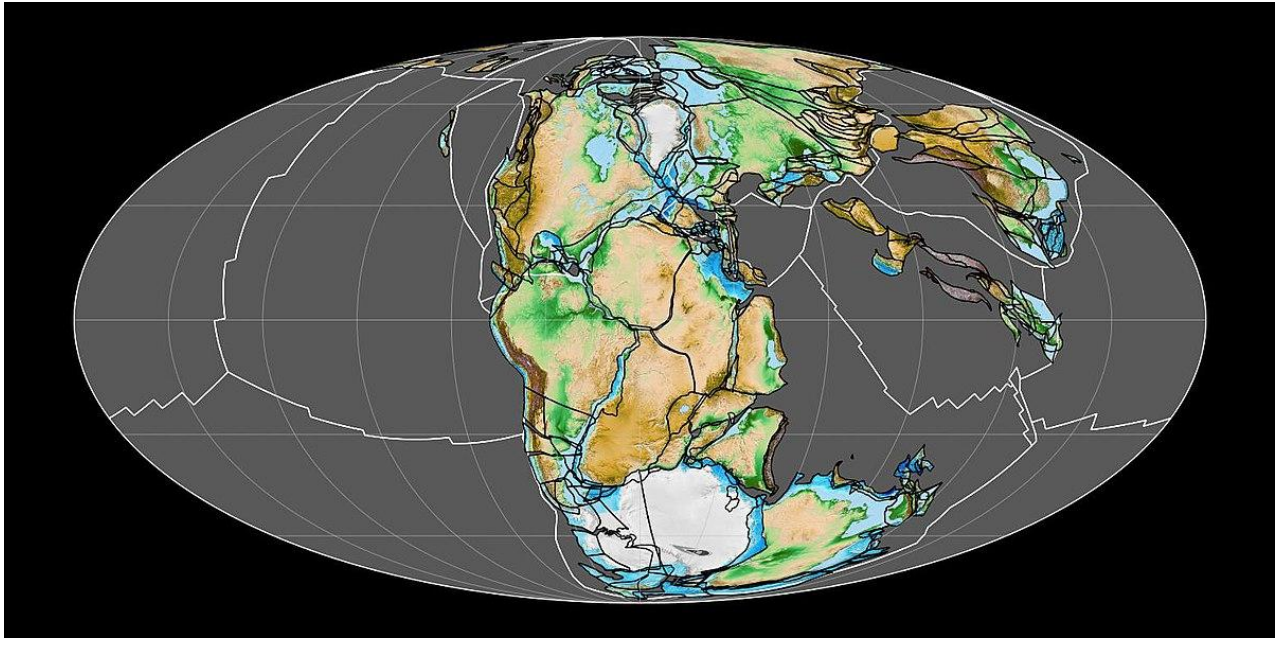
As continents have drifted, ocean passages have opened and closed over time.

As a result, there have been major changes in ocean currents.

This has affected energy collection and transport, and hence, climate.

Physical Changes To The Earth

Pangaea – the “super continent”



Wikipedia

Physical Changes To The Earth

Pangaea – the “super continent”

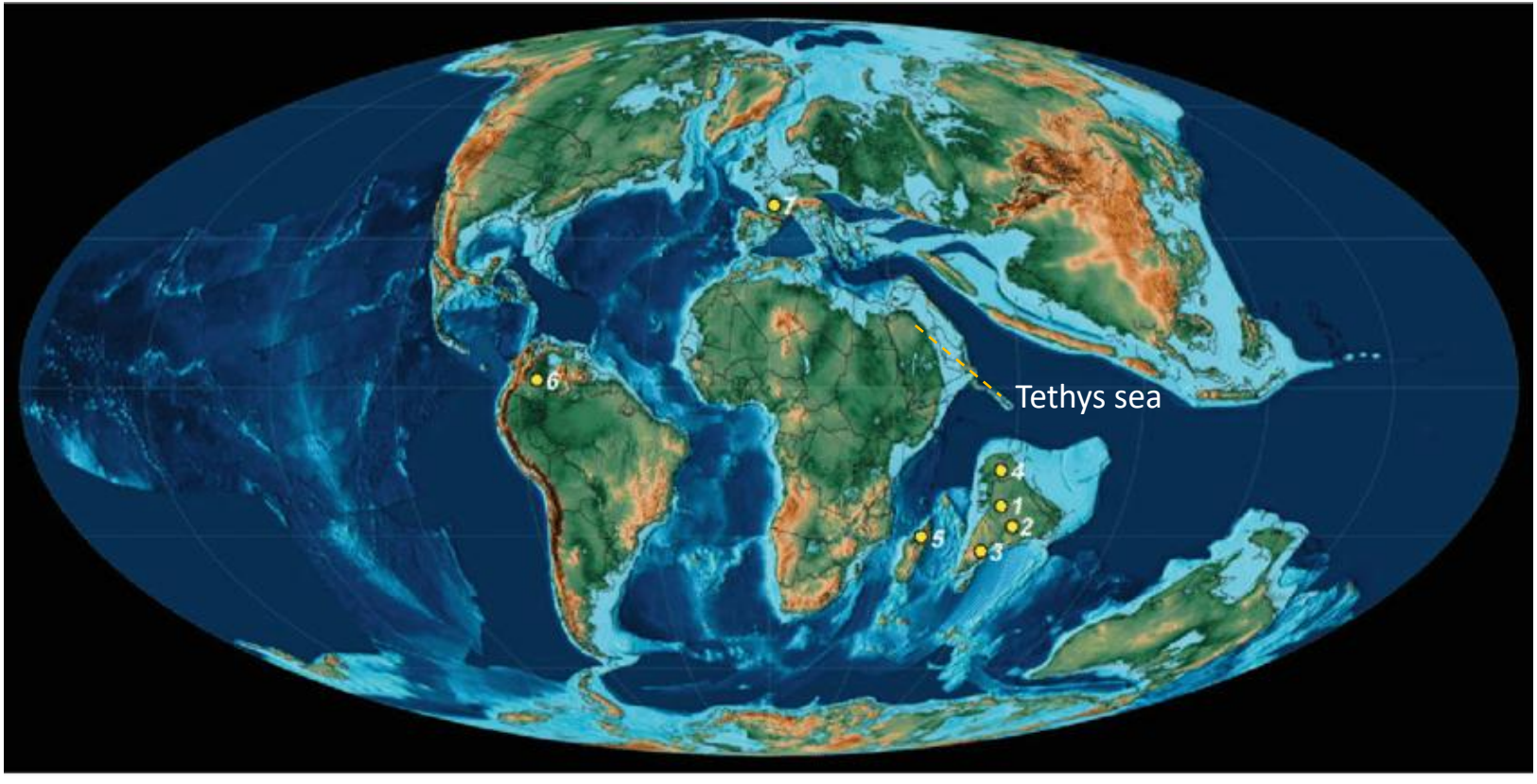
Surrounded by the Tethys Sea

Pangaea break-up began 175 million years ago

Before

After

Late Cretaceous Period – 66 Million Years Ago



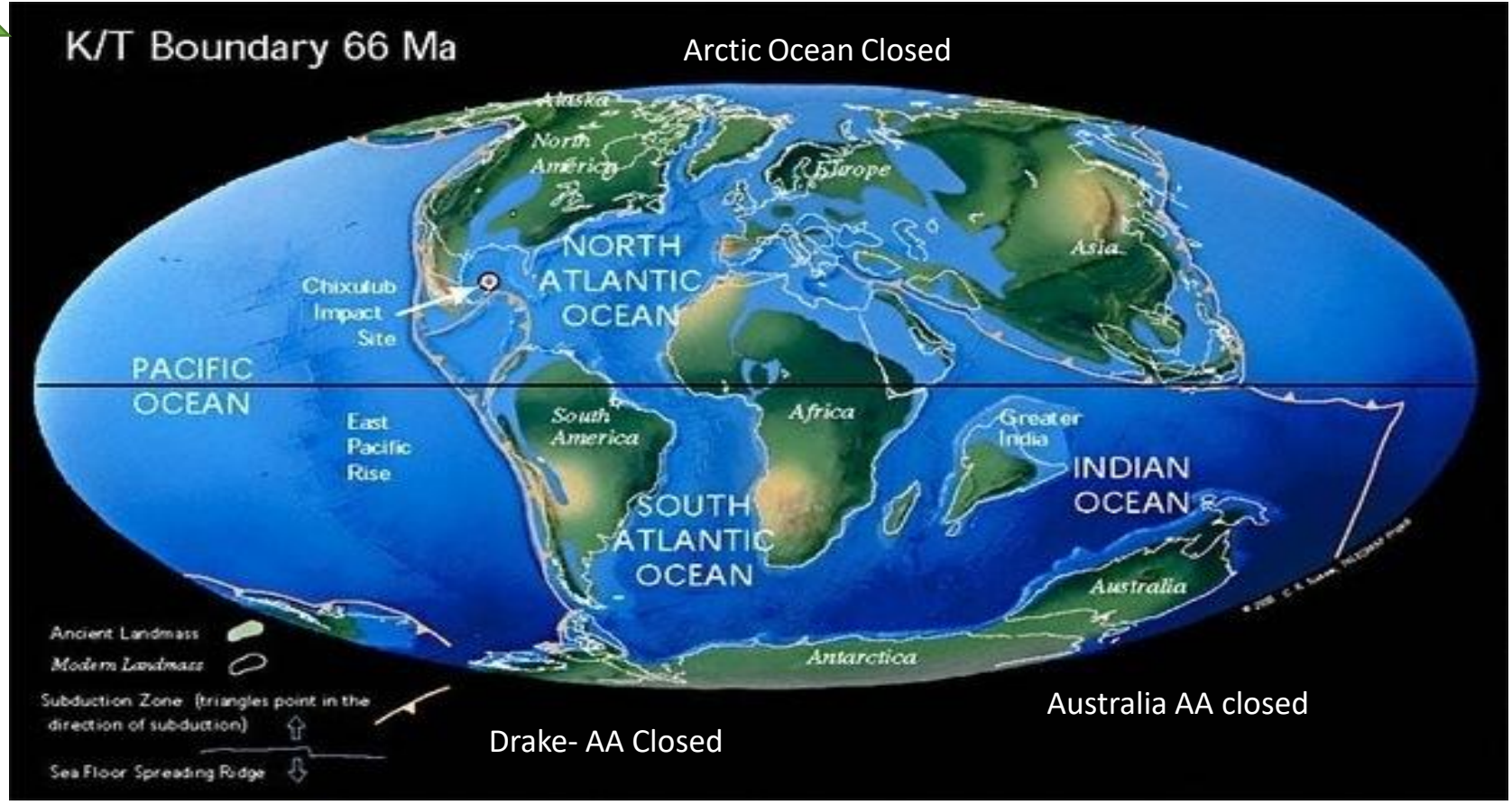
K

C.R. Scotese 2002

EOCENE 56 Million Years Ago

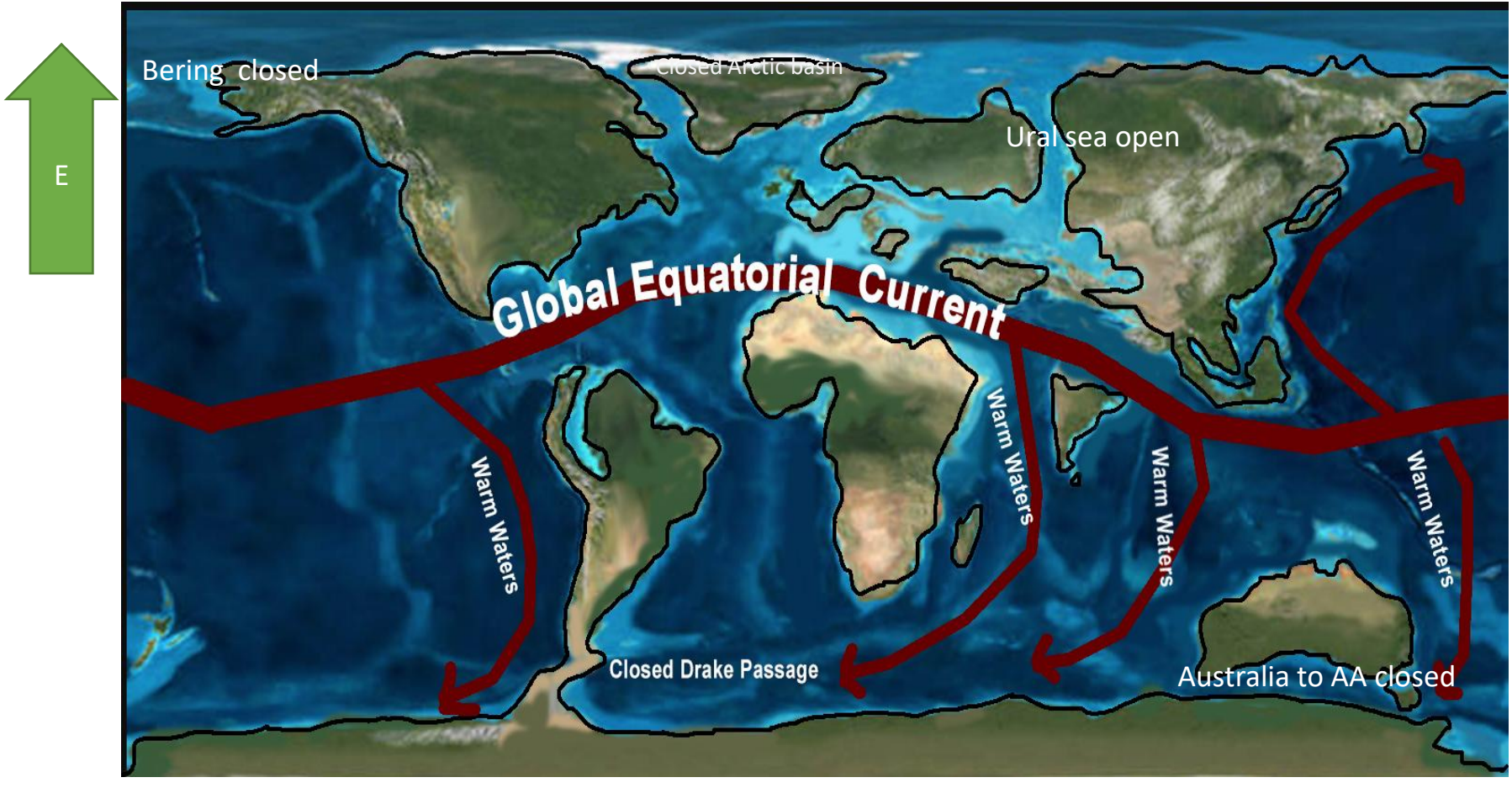
No Polar Ice Caps

E



C.R. Scotese, 2002

Eocene 56 MYA Ocean Currents & Connections



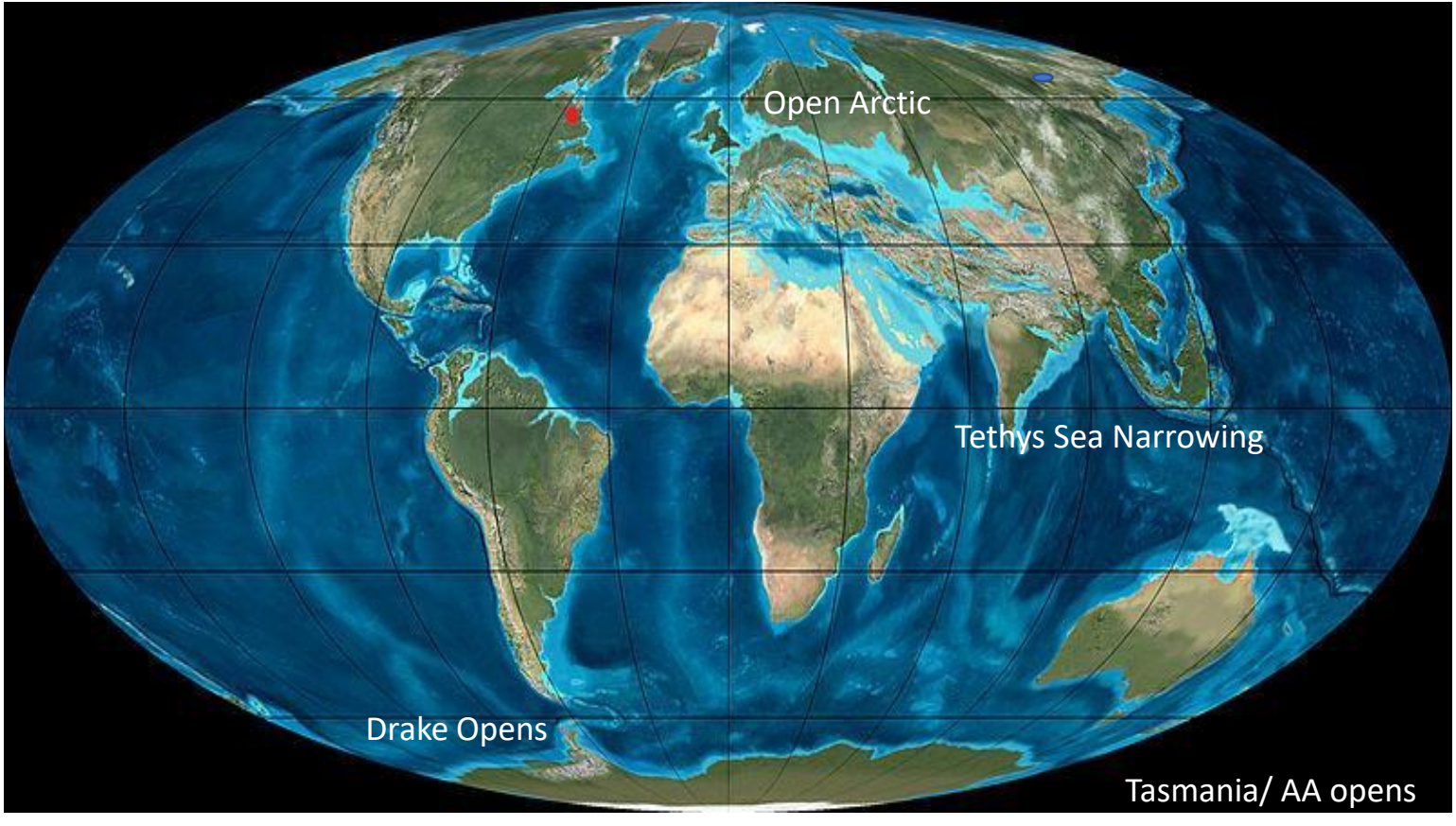
Wikimedia

Oligocene – 34 Million Years Ago

Closure of Equatorial Current passages
Opening of Southern Polar Currents

No northern Ice Cap

O

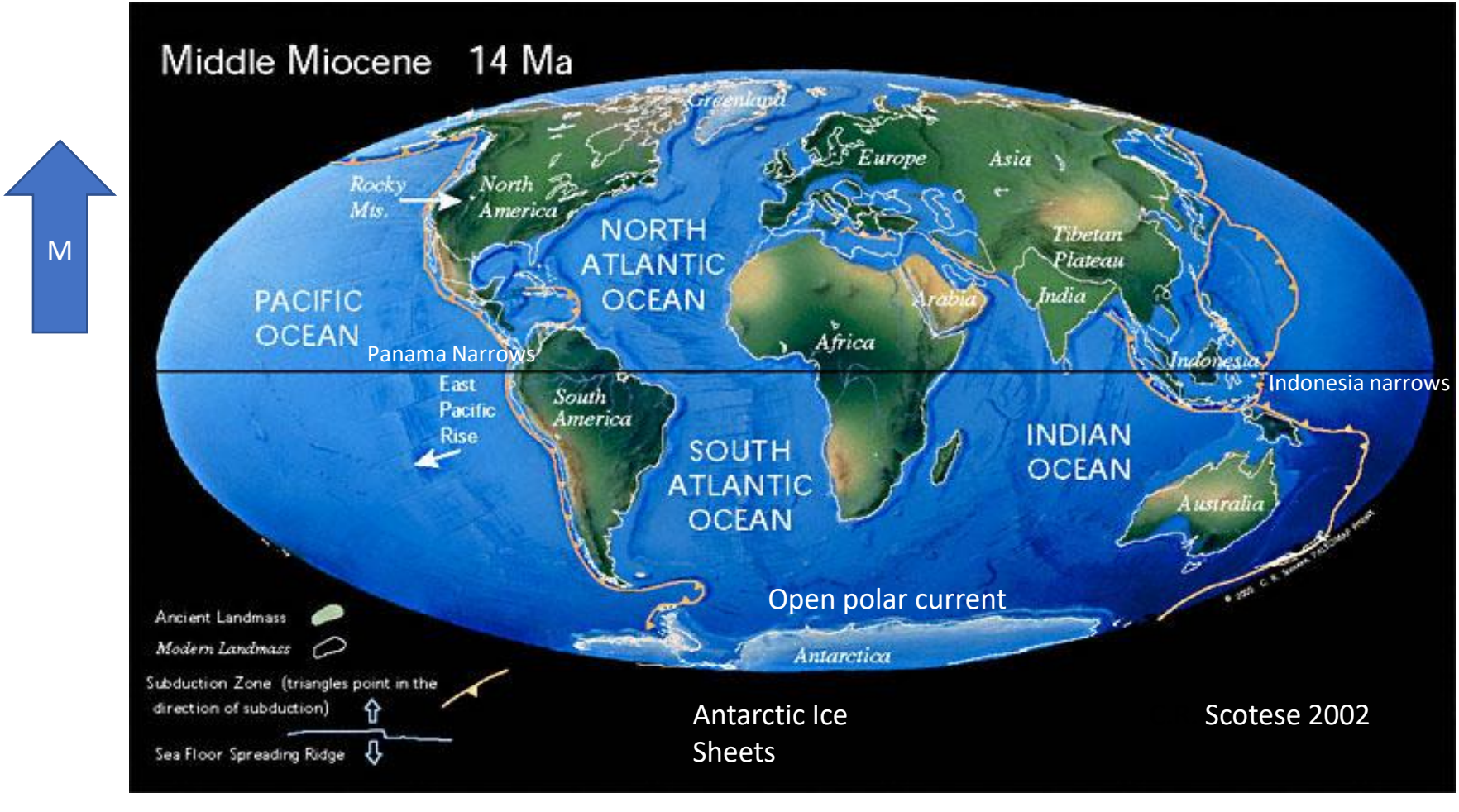


C.R. Scotese, 2002

South Polar ICE SHEETS begin

Mid-Miocene 14 MYA

Further Restriction and Closure of Equator Current
Opening of Southern Hemisphere Currents



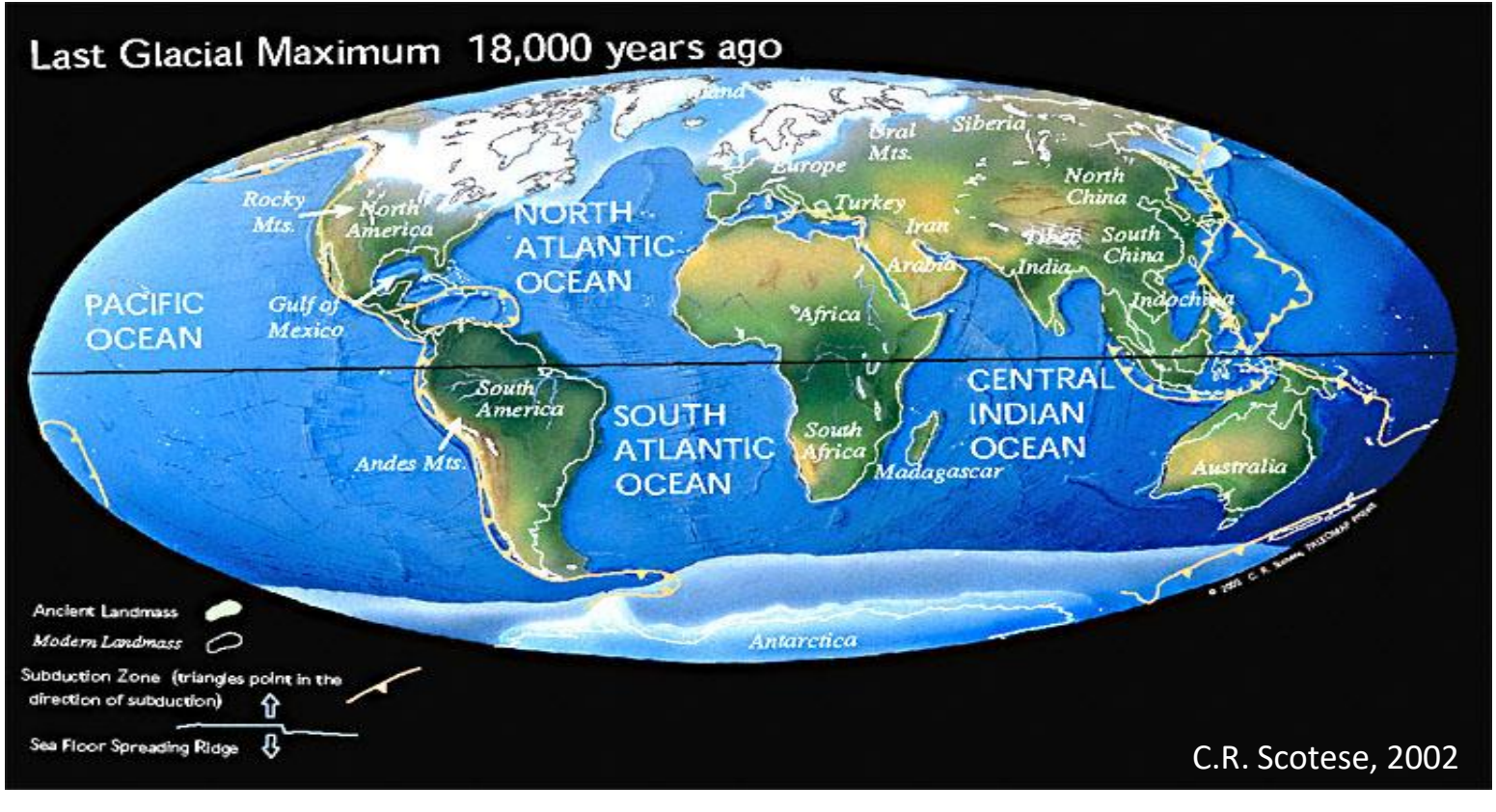
Antarctic Ice Sheets

Scotese 2002

Default Climate Condition During The Pleistocene is: Glacial, Cold, Dusty for the last 3.3 Million Years

Panama and Indonesia Closure, terminating Equatorial Current

P

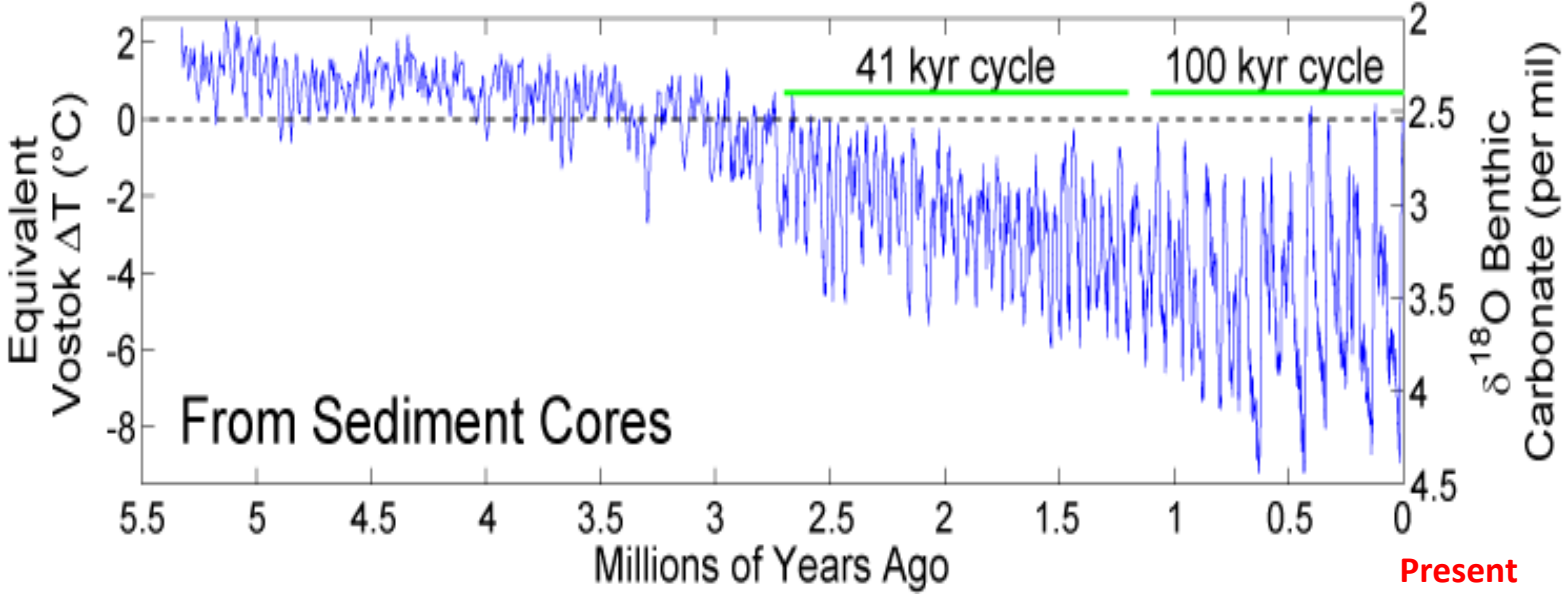


Isthmus of Panama Closes 3.3 MYA

NASA

THE LAST 5 MILLION YEARS

Temperature Is Falling, with 41,000 and then 100,000 year Glacial Cycles



Wikimedia

THE PLEISTOCENE

GLACIAL ICE Control COLD STORAGE 3.3 MYA

P

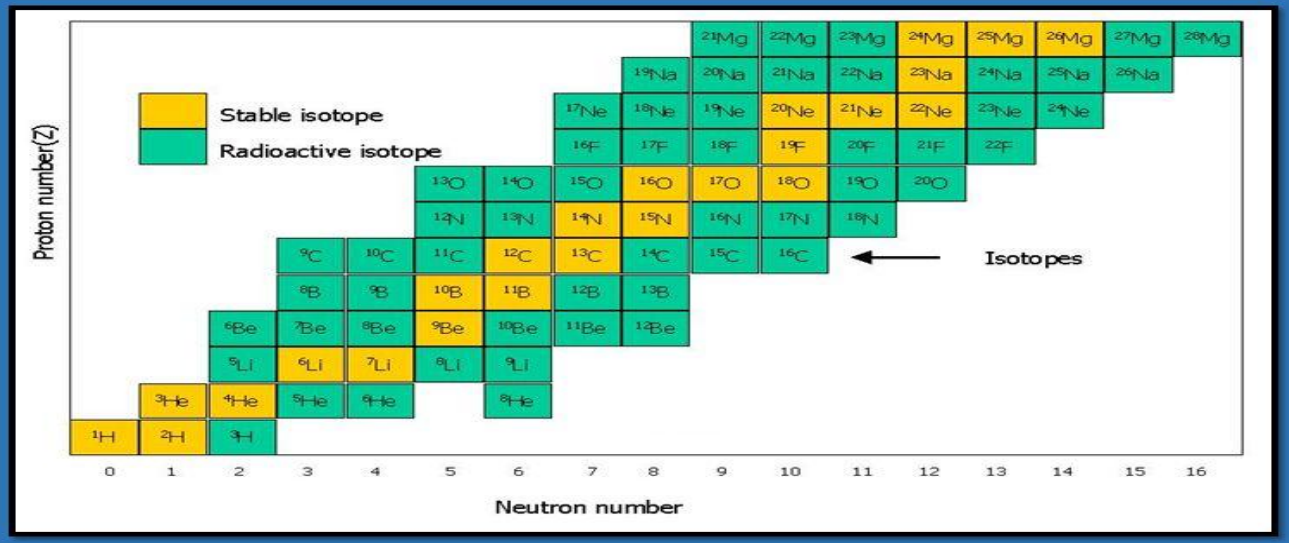
NEW DATA RESOURCE

Proxy data from several sources and techniques.

Stable Isotopes

Slideplayer

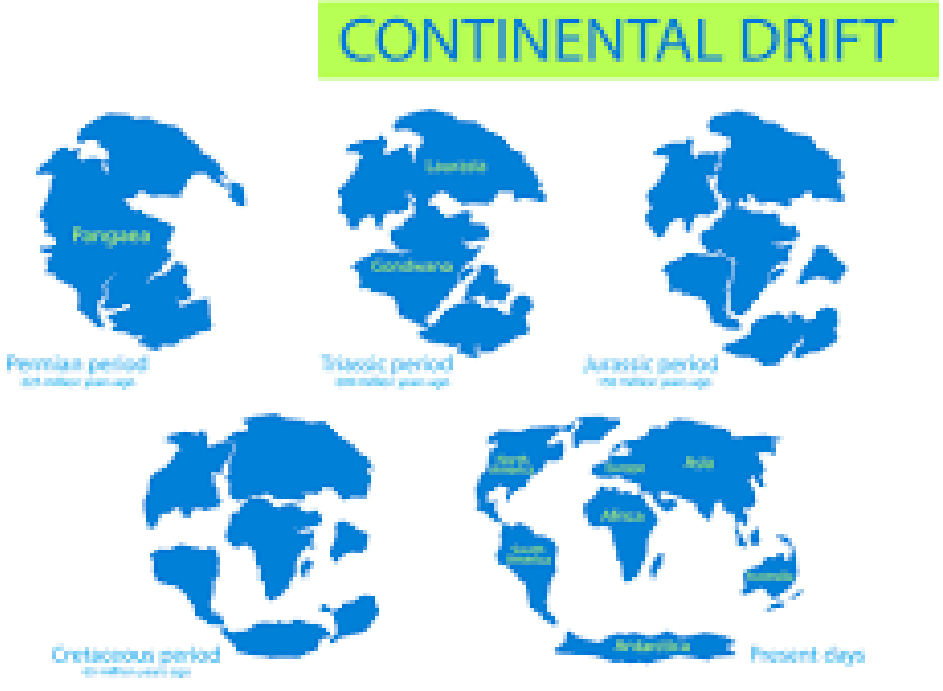
Many different isotopes



NEW DATA RESOURCE

Proxy data from several sources and techniques.

Continental Drift



NEW DATA RESOURCE

Proxy data from several sources and techniques.

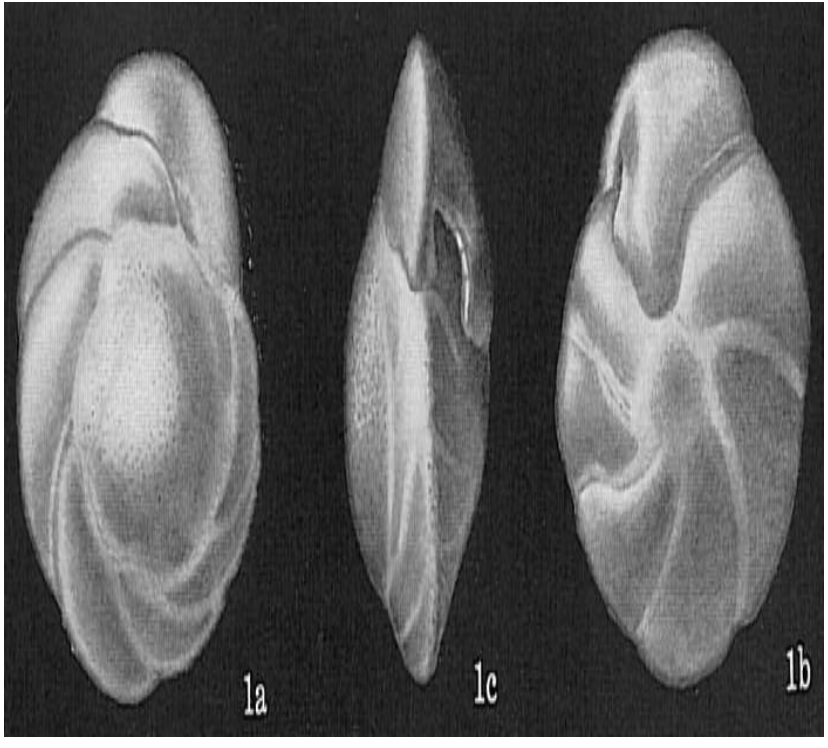
Continental Drift

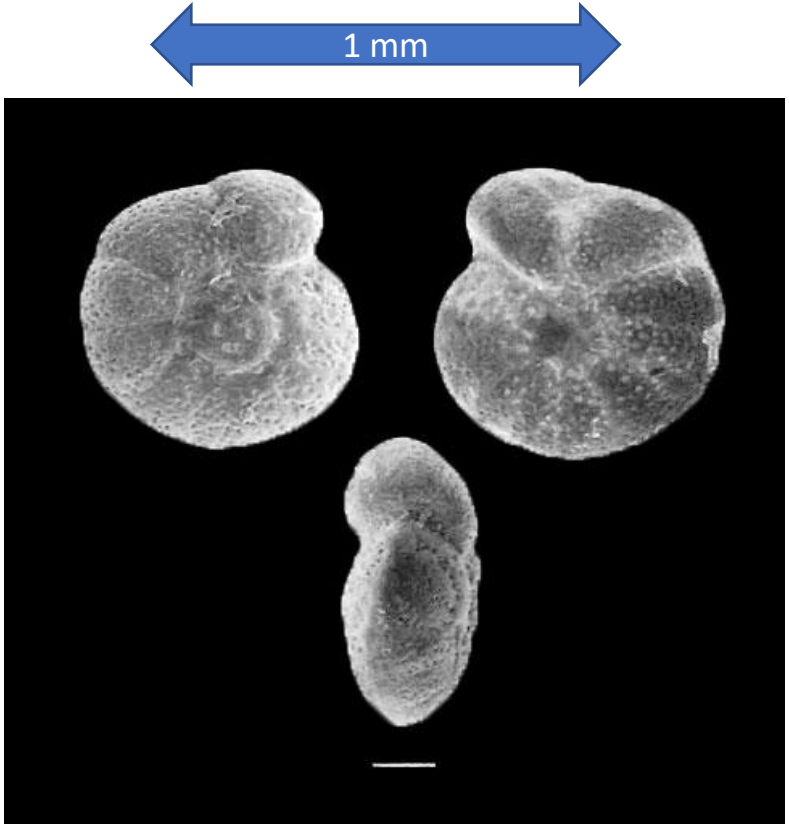
New, extensive data set became available in September 2020.

High sample density and accuracy.

Very Long Time Series analysis of ^{18}O and ^{13}C in microscopic plankton.

Benthic Forams, Cibicidoides & Nuttallides

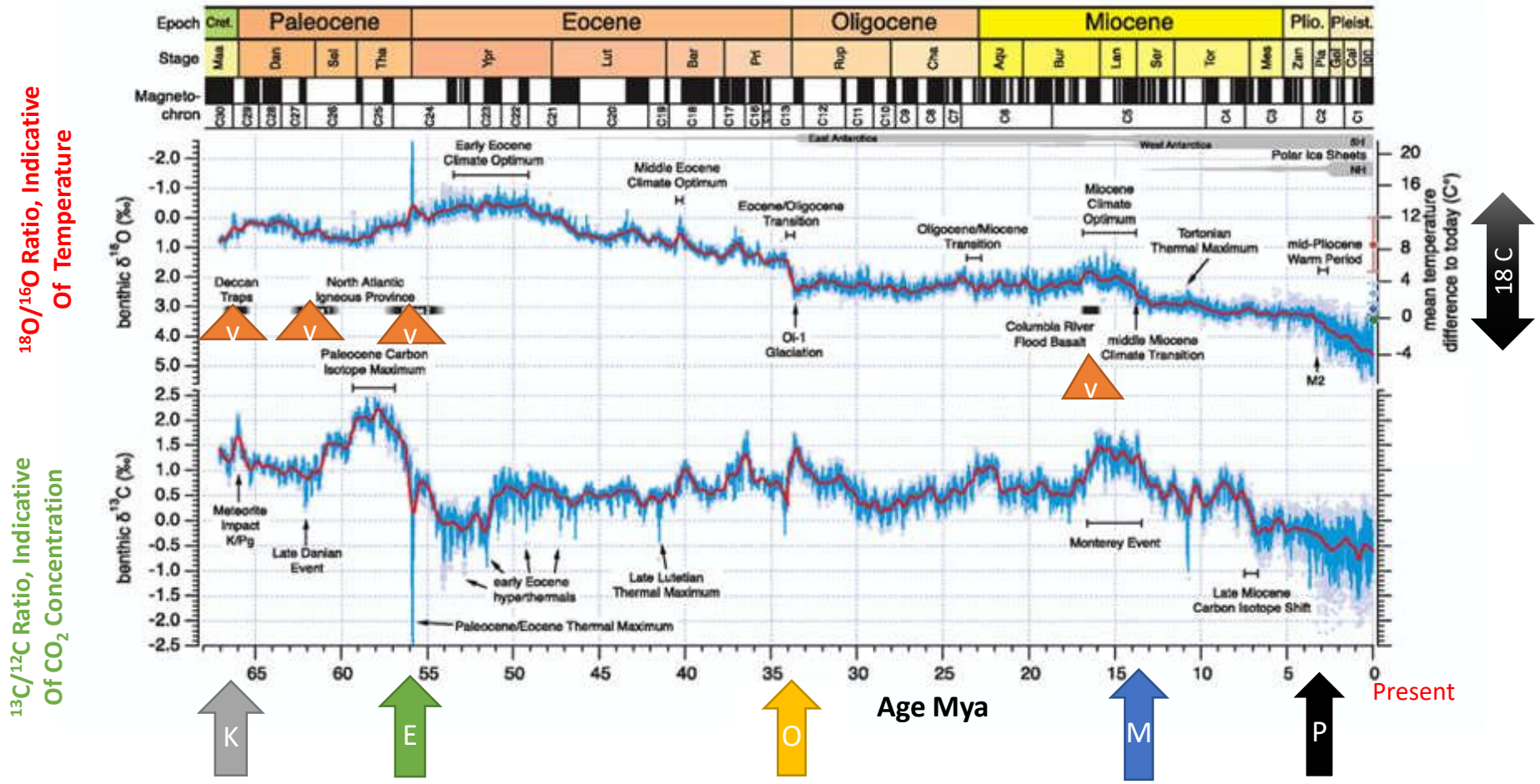




Sciencedirect.org

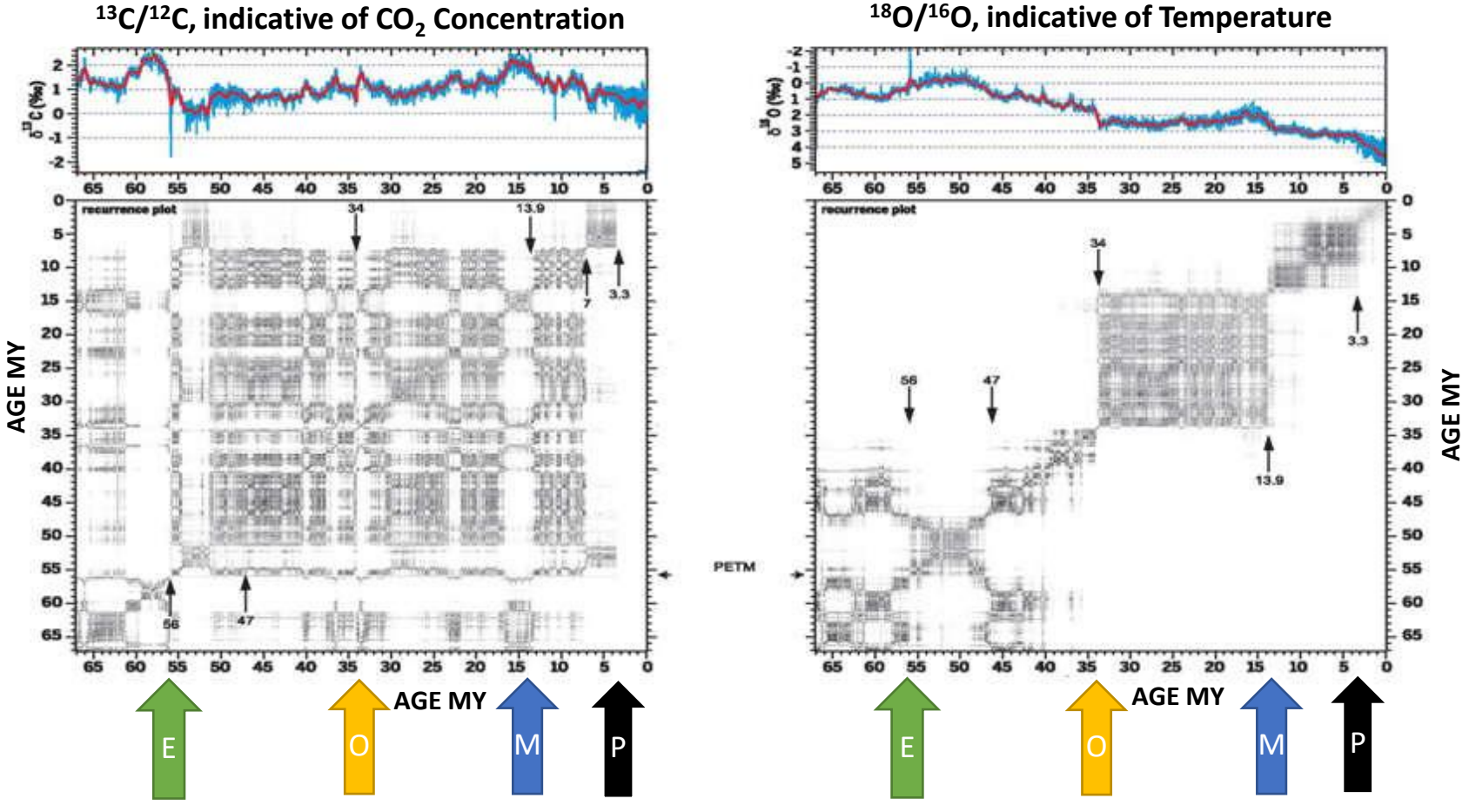
67 Million Year Record Of Temperature and CO_2 Concentration Using Isotopic Analysis Of Benthic Forams From Sea Sediment Cores

Westerhold - Science, Sept 11th 2020



Recurrence Plots of $^{13}C/^{12}C$ and $^{18}O/^{16}O$ Benthic Forams

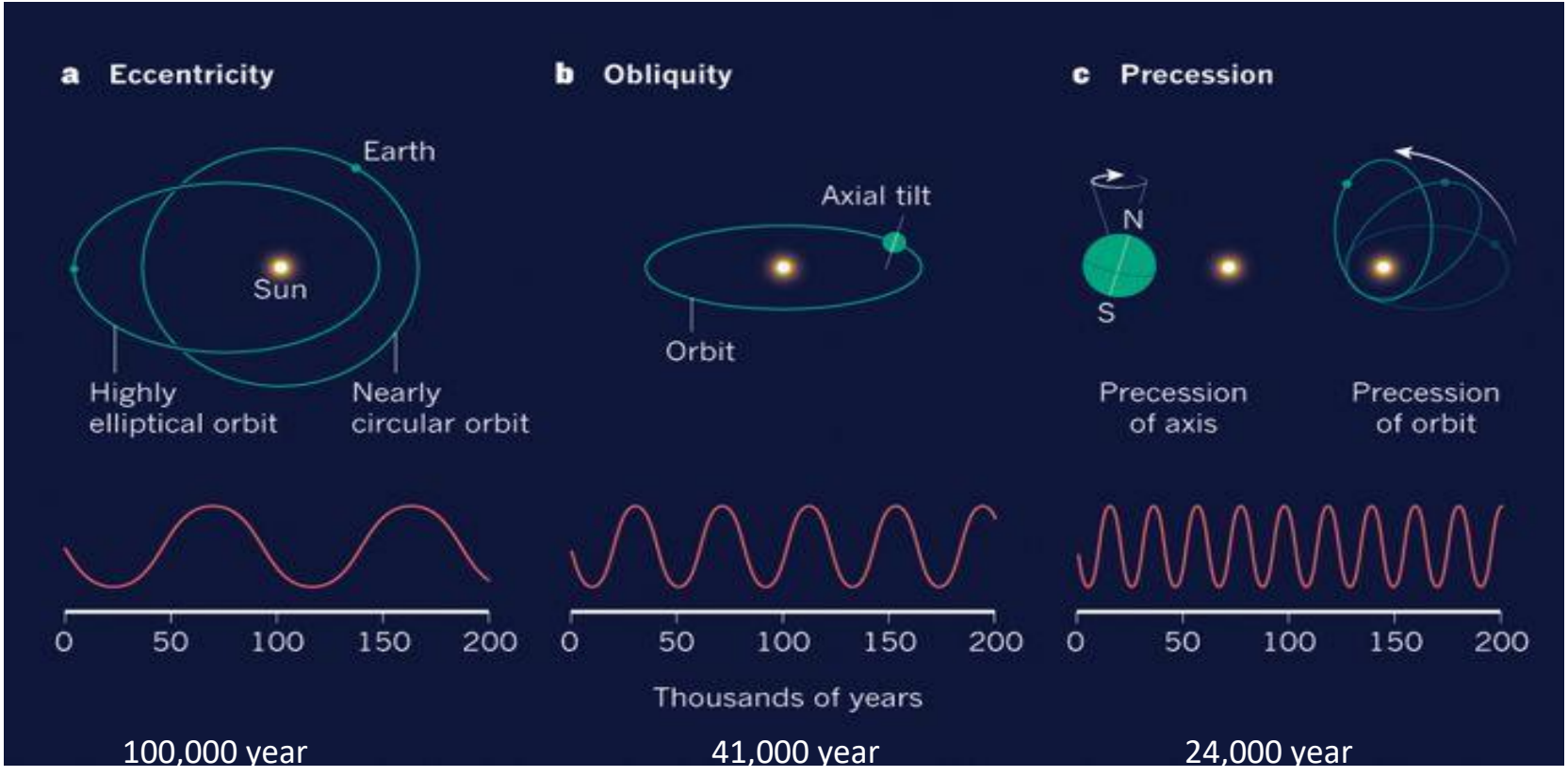
Westerhold - Science, Sept 11th 2020



Incoming Solar Energy Is Affected by Cyclic Orbital Variations

Milankovitch Cycles have periods of 24,000, 41,000, and 100,000 years.

Milankovitch Cycles 100,000, 41,000 & 24,000 Years



100,000 year

41,000 year

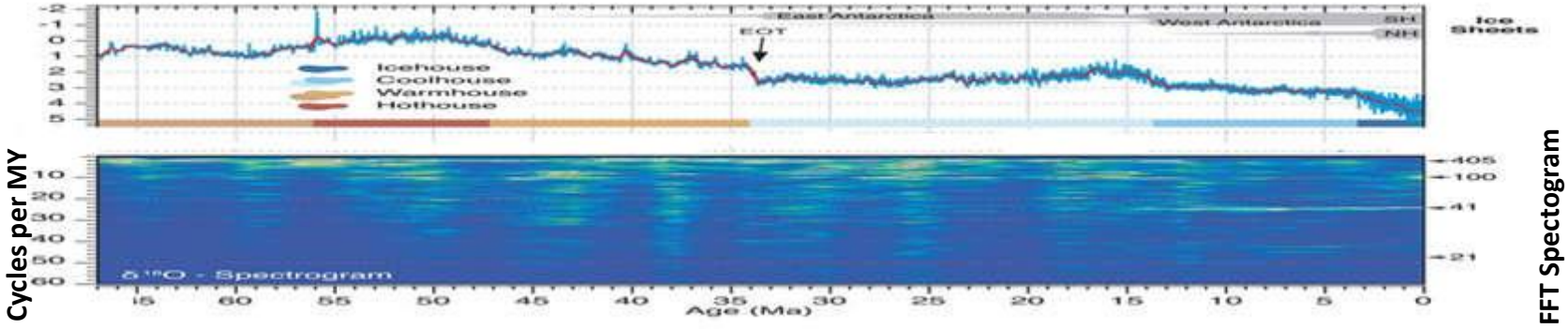
24,000 year

EnvironmentCounts.org

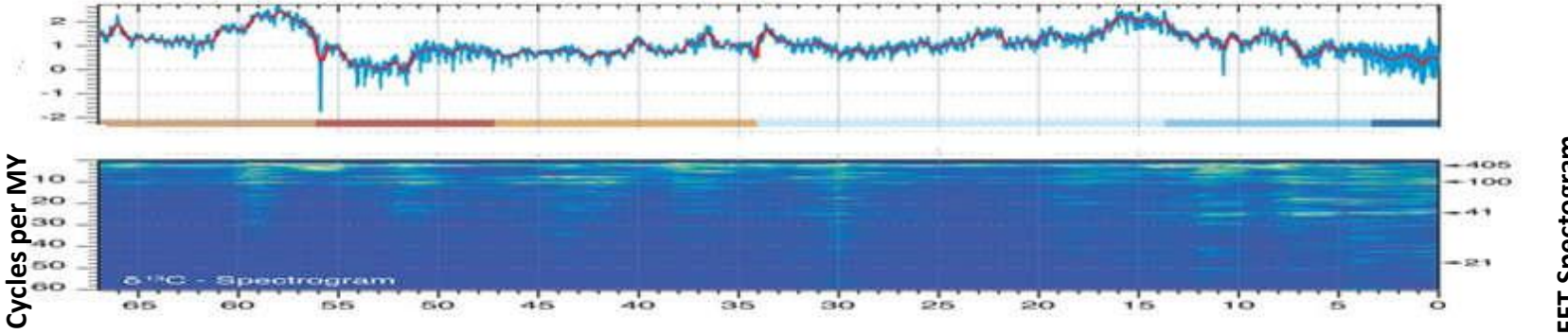
FFT Analysis of $^{13}C/^{12}C$ and $^{18}O/^{16}O$ Benthic Forams

Westerhold - Science, Sept 11th 2020

$^{18}O/^{16}O$ Ratio, Indicative Of Temperature

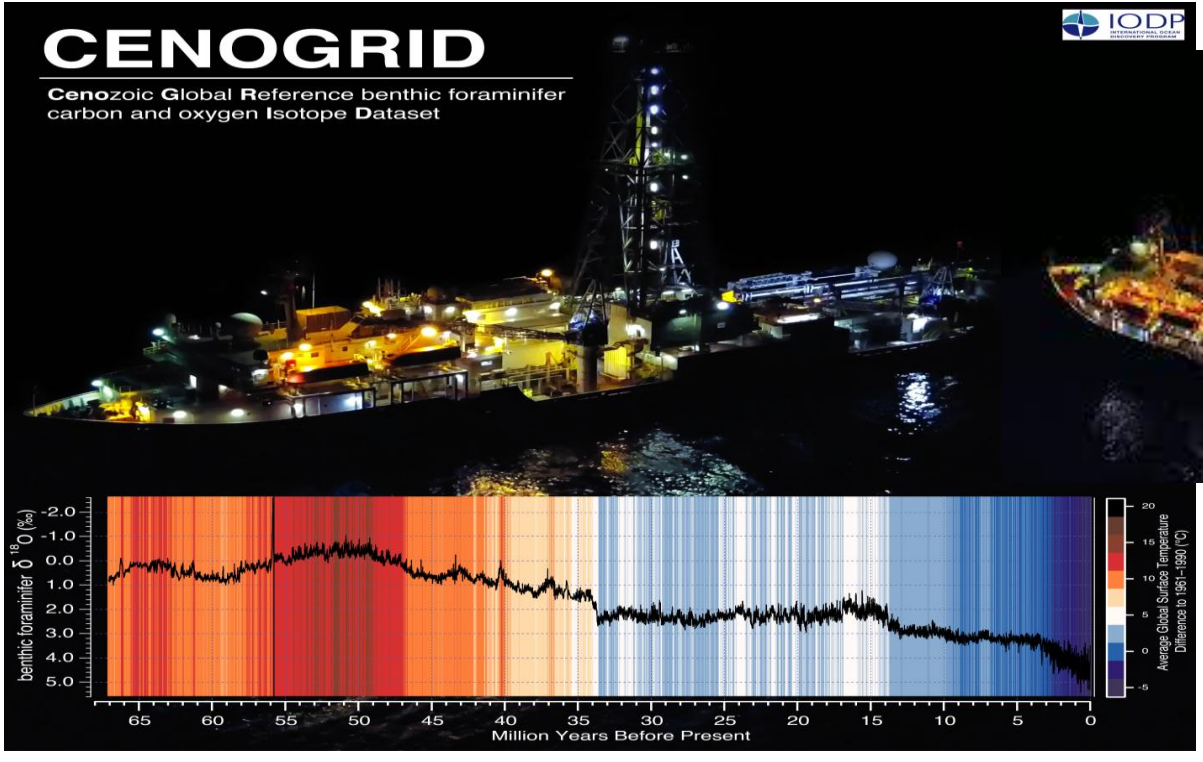


$^{13}C/^{12}C$ Ratio, Indicative Of CO_2 Concentration



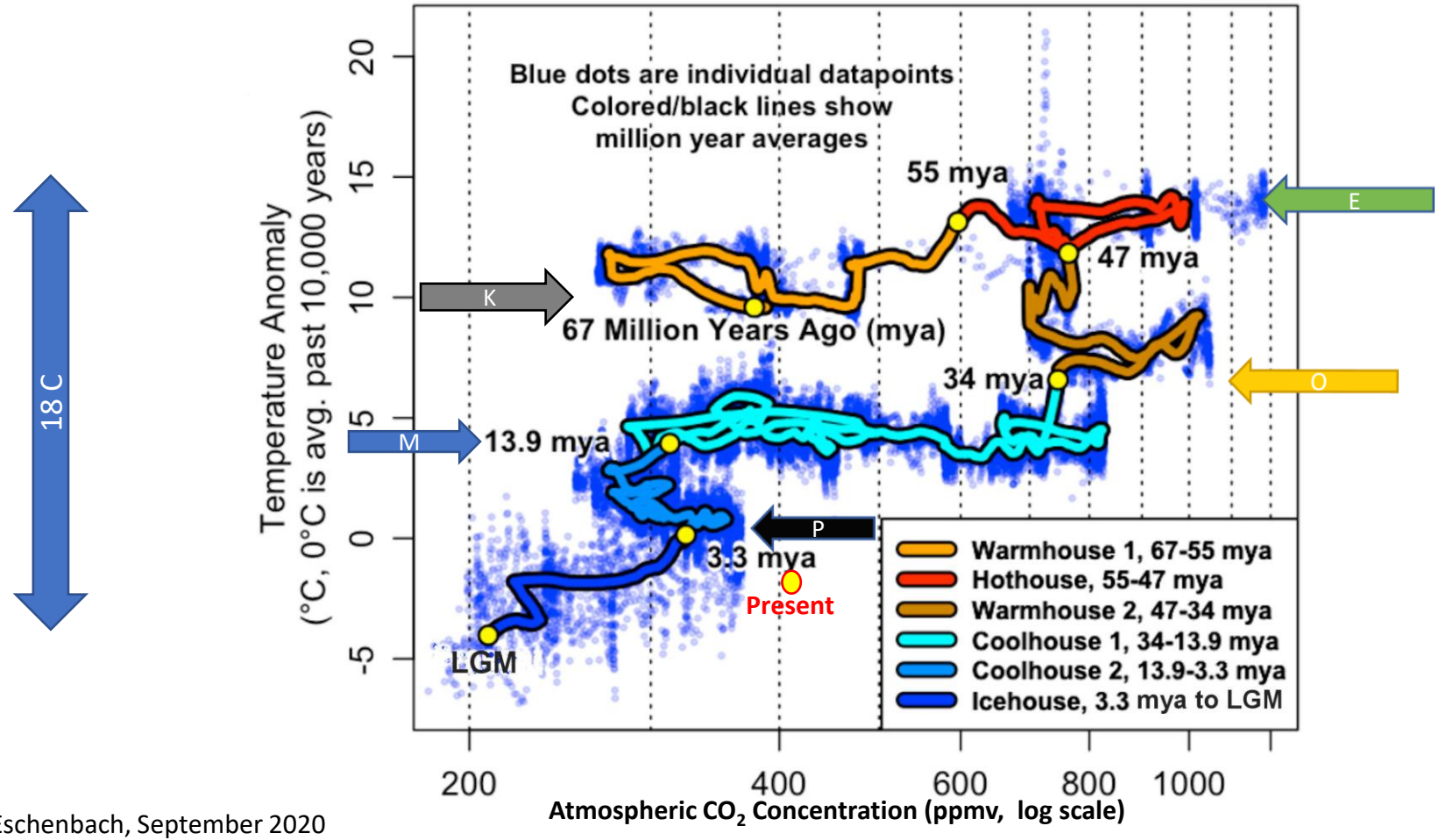
67 Million Years Of CENOGRID Temperature vs Atmospheric CO_2 Concentration

Willis Eschenbach re-plotting of the CENOGRID data



Cambridge Earth Science

67 Million Years Of CENOGRID Temperature vs Log Of Atmospheric CO_2 Concentration

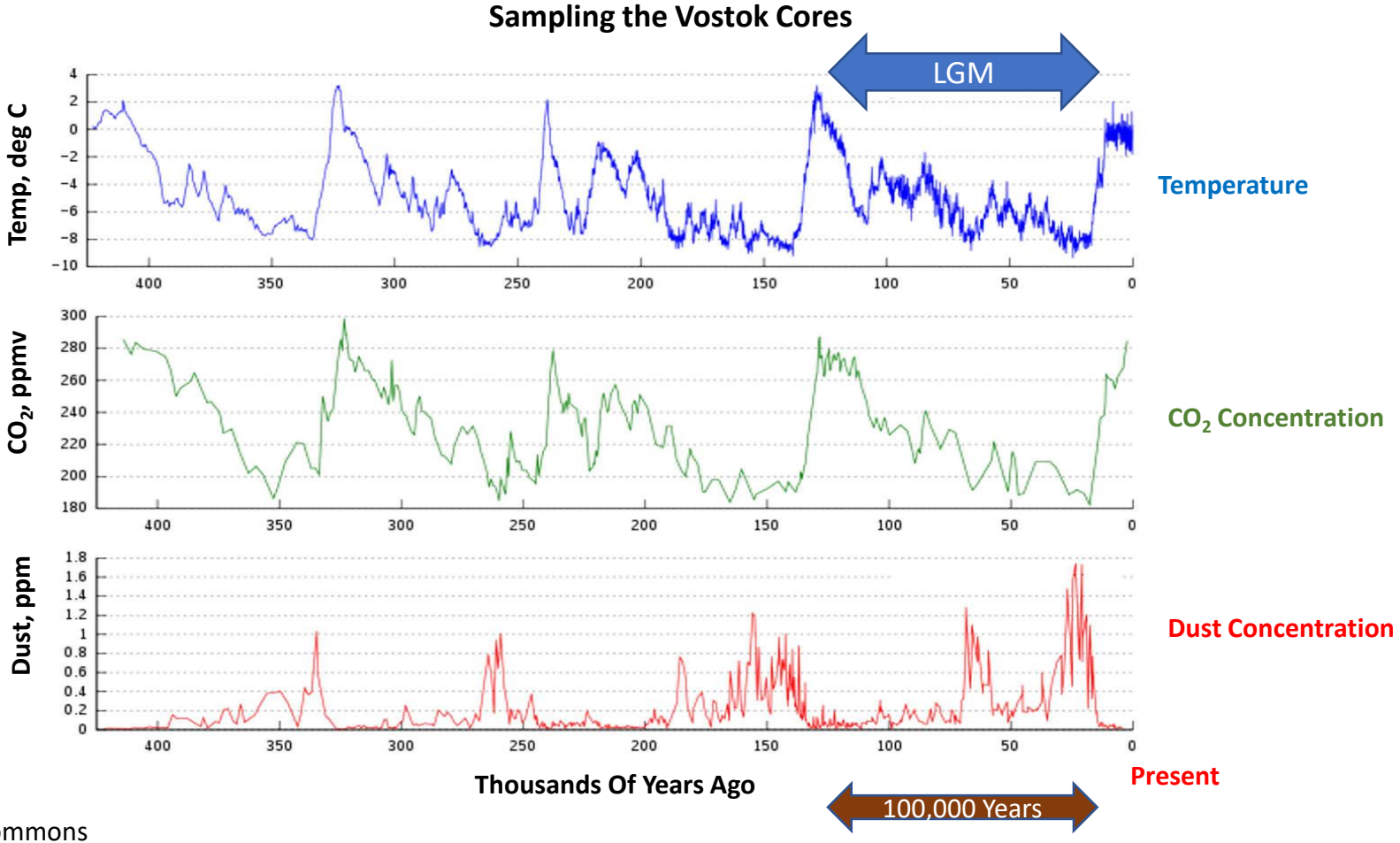


Eschenbach, September 2020

LATEST GLACIAL MAXIMUM (LGM)

120,000 Years ago to 20,000 Years ago

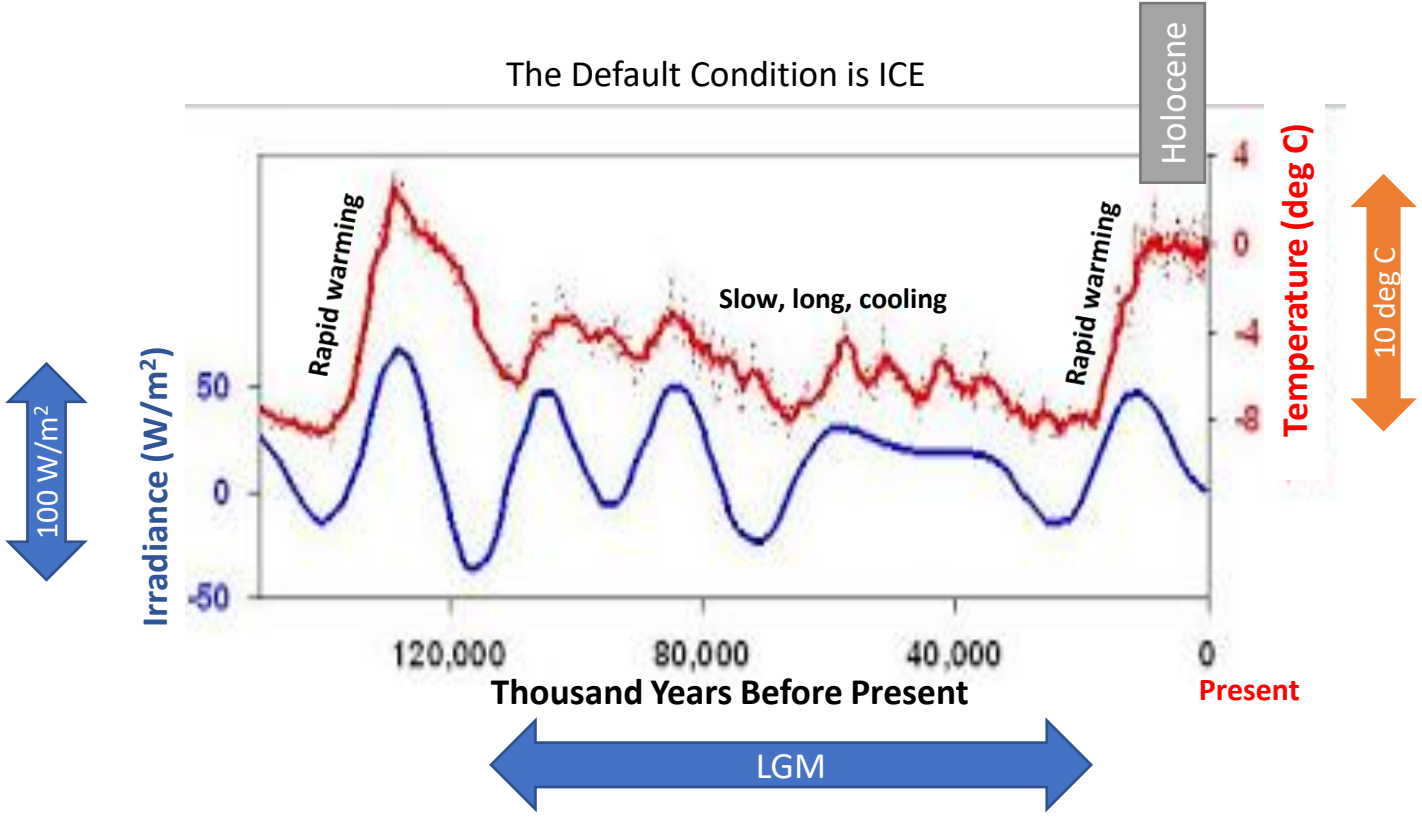
Antarctic Dust Inversely Proportional To Temperature During Glacial Cycles



Wikimedia Commons

Recovering From The Latest Significant Glaciation “LGM”

Cycles of Irradiance (rate of “insolation”)

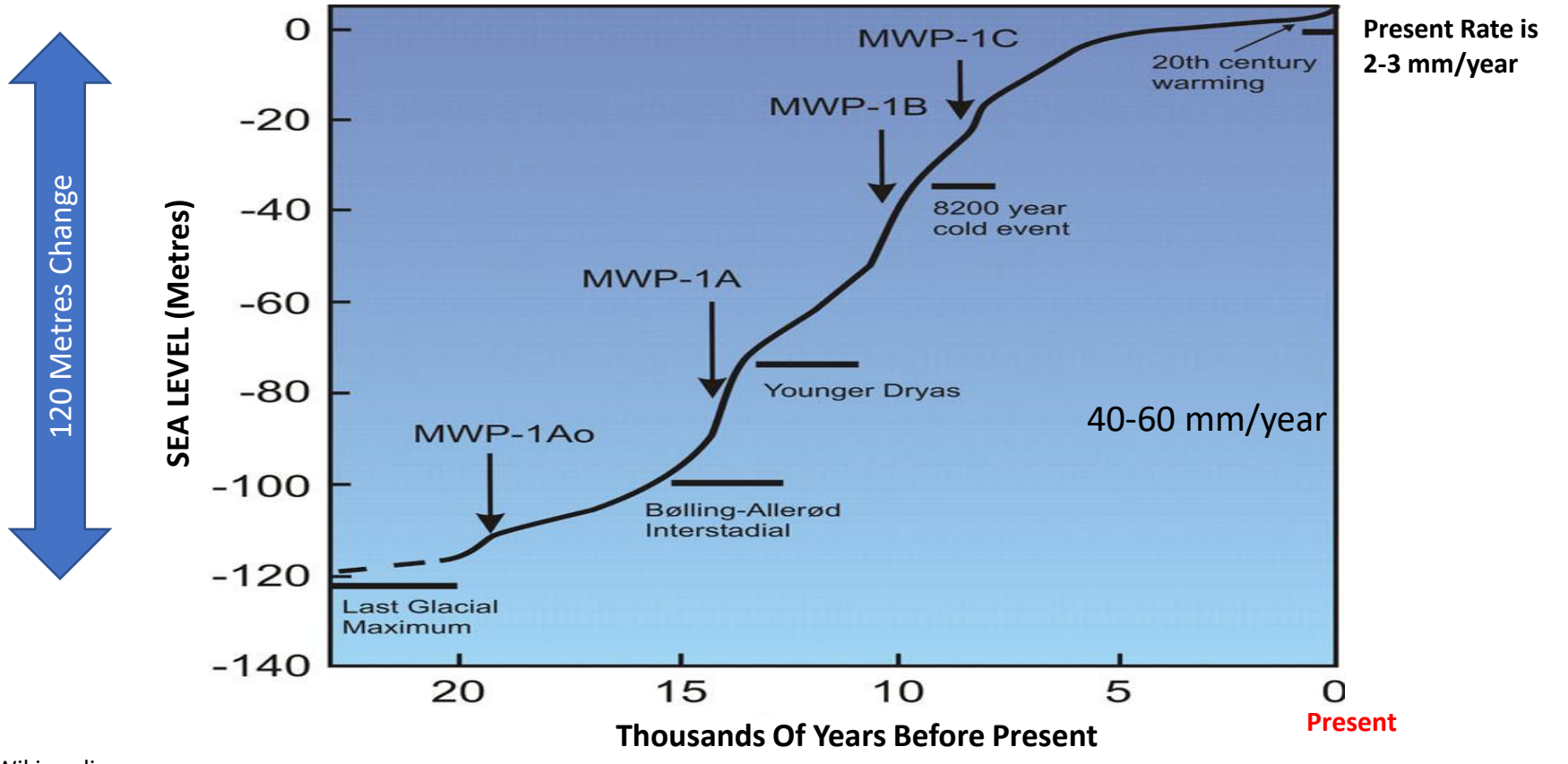


Termination DURATION From Glacial to Interglacial

Last 9 Glacial Cycles

Time Period (KYBP)	Duration of transition (KY)
18-11	7
135-130	5
246-242	4
341-334	7
431-426	5
540-529	11
630-626	4
741-738	3
796-788	8

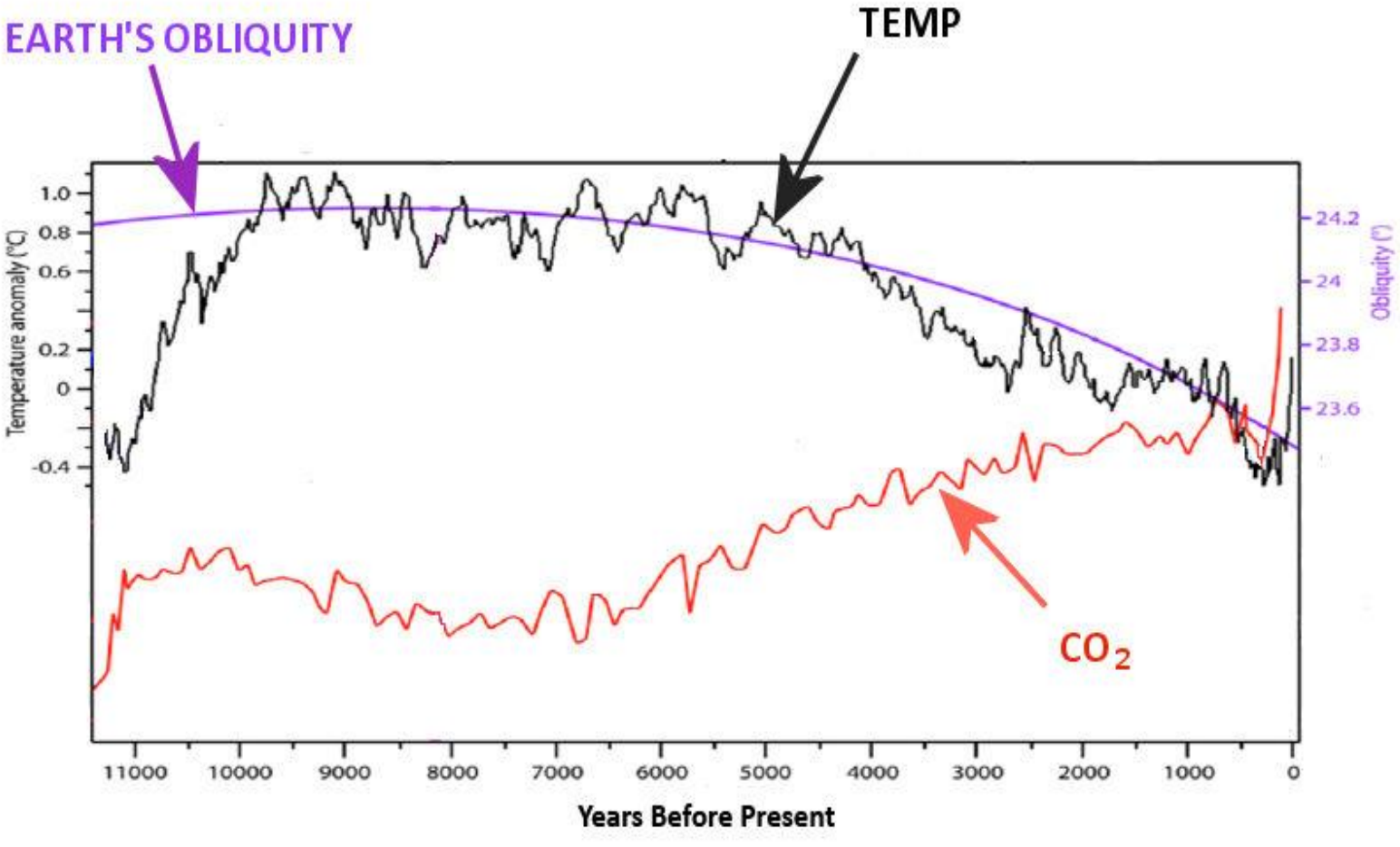
Latest Glacial Max (LGM) Melt Water Pulses Over The Last 20,000 Years



Wikimedia

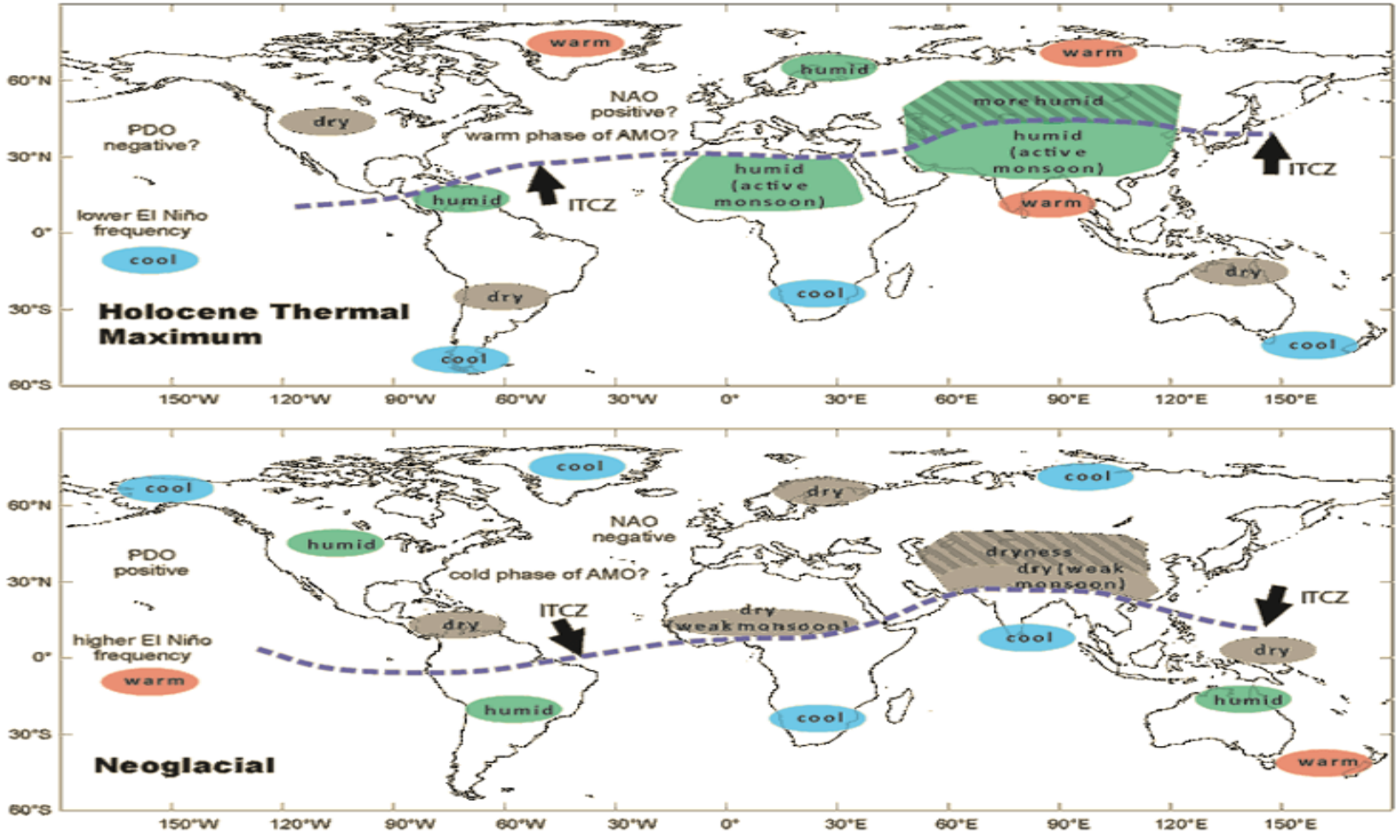
Changes During The Holocene – The Last 11,000 Years

The Holocene Record



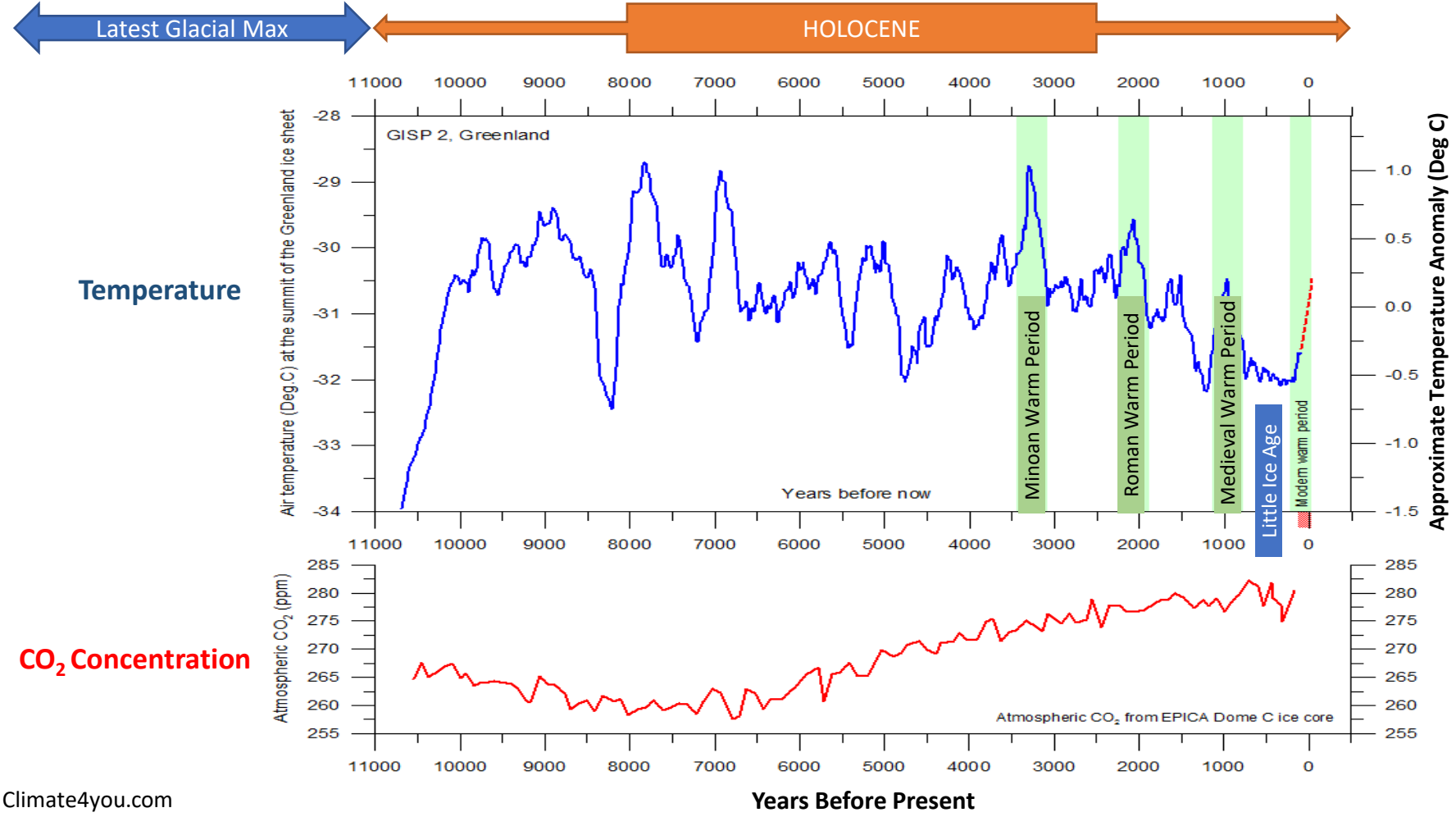
Climateetc.org

Holocene: Thermal Maximum vs. Neoglacial

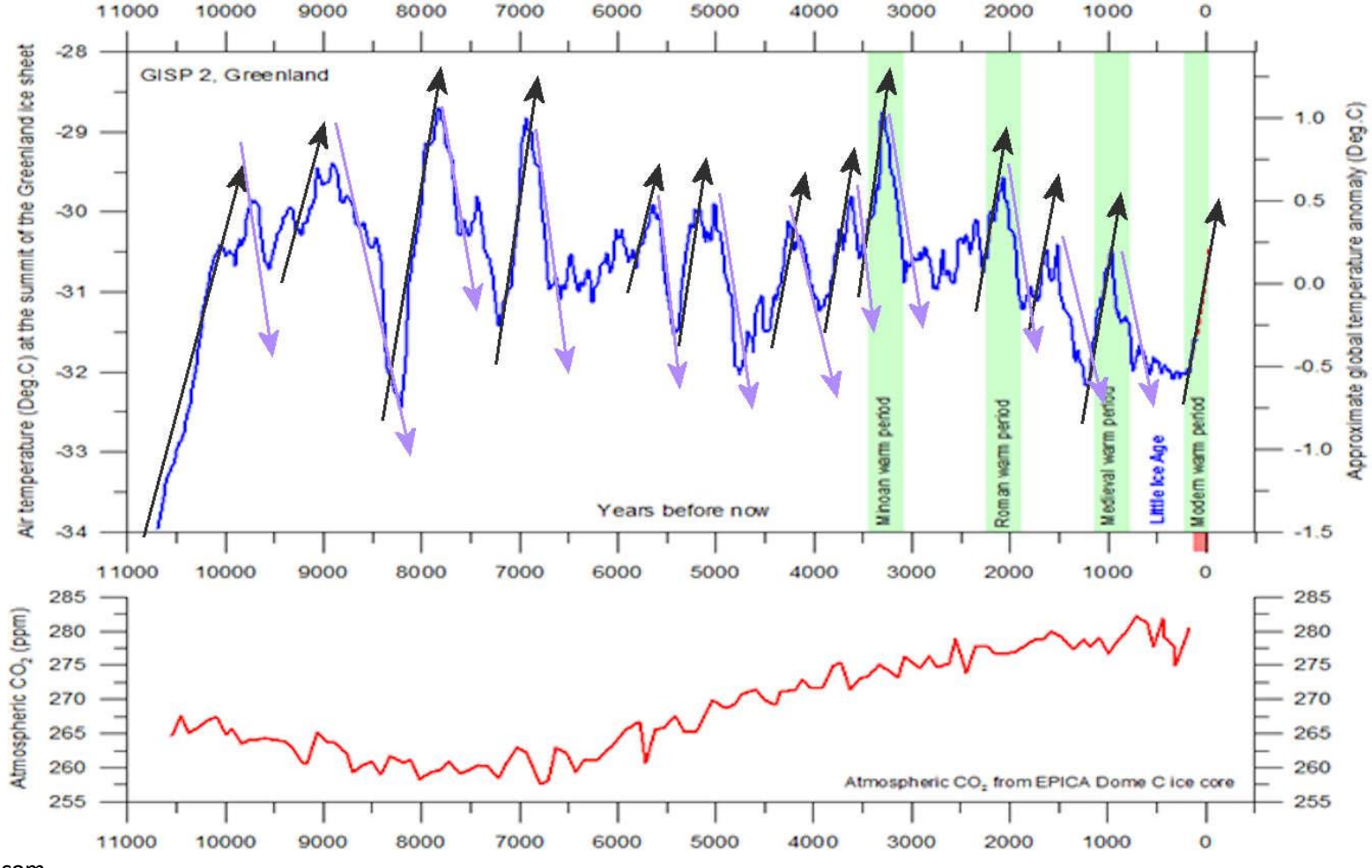


Pastglobalchanges.com

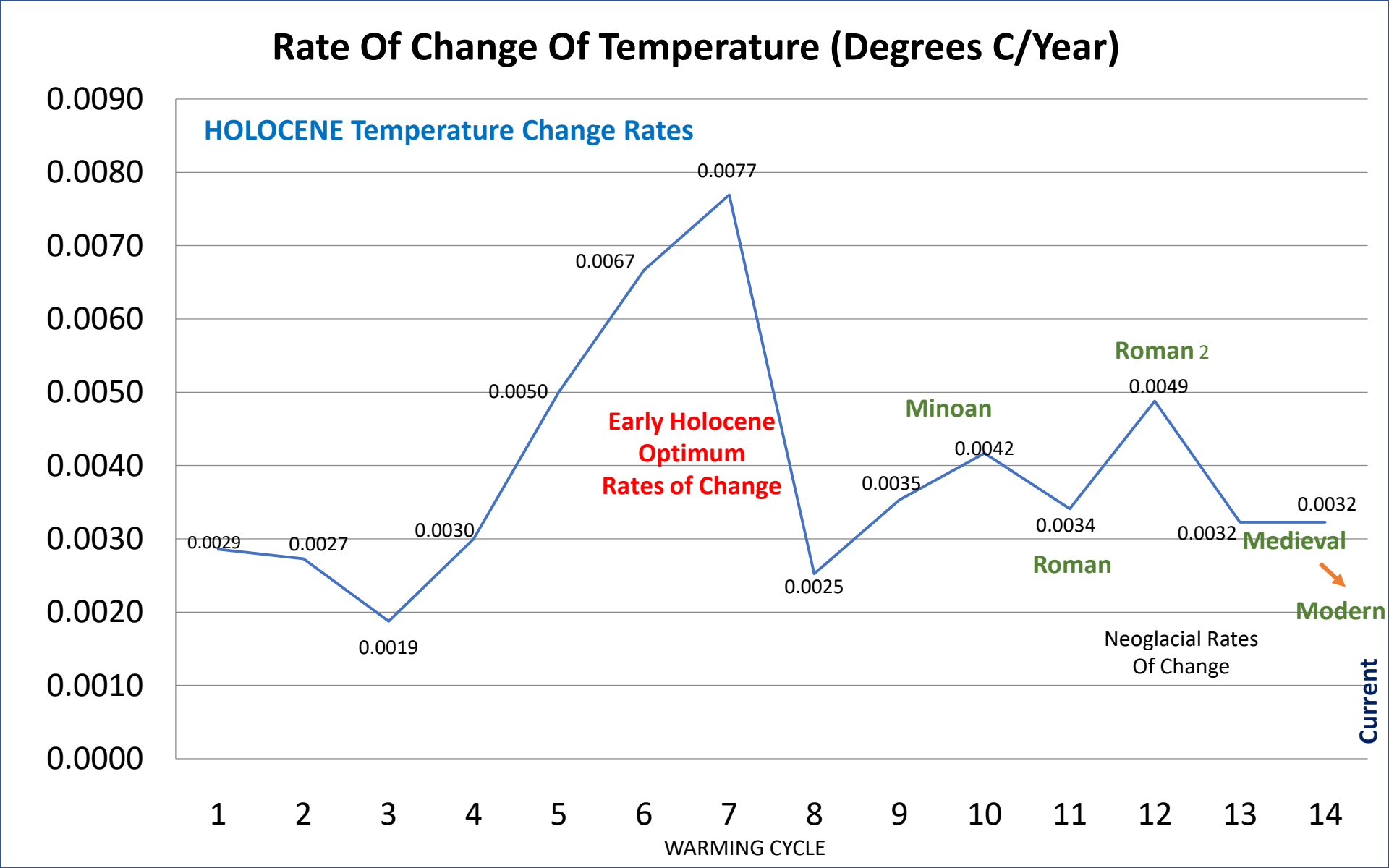
HOLOCENE Warm And Cool Periods



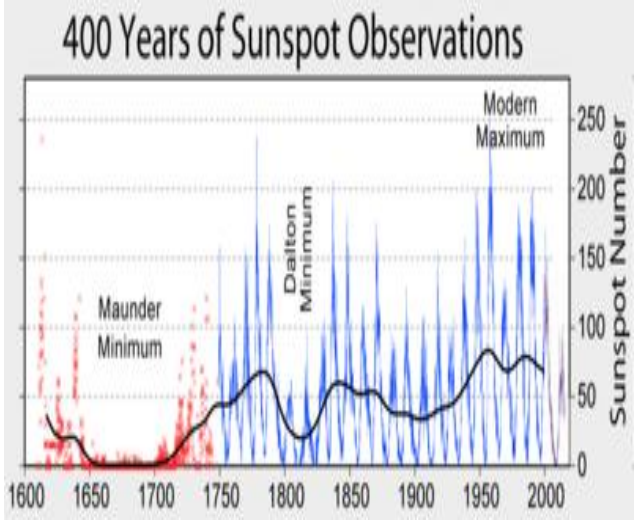
Rates of Holocene Temperature Change



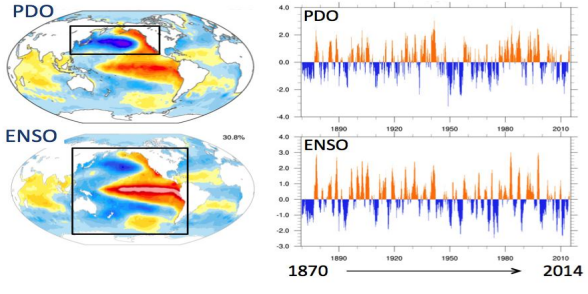
Climate4you.com

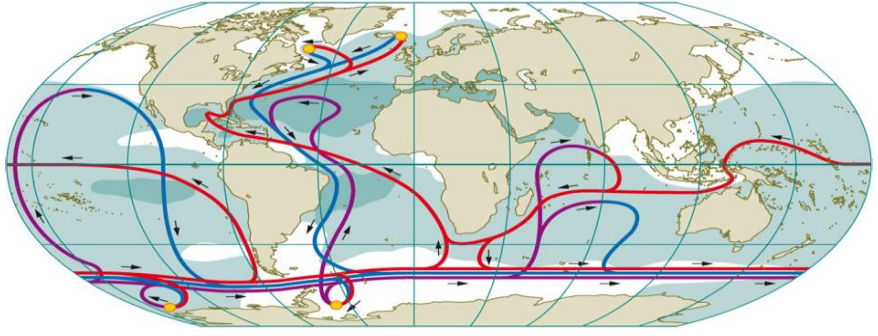

Rate Of Change Of Temperature (Degrees C/Year)
HOLOCENE Temperature Change Rates
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0.0029
0.0027
0.0019
0.0030
0.0050
0.0067
0.0077
0.0025
0.0035
0.0042
0.0034
0.0049
0.0032
0.0032
Early Holocene
Optimum
Rates of Change
Minoan
Roman 2
Roman
Medieval
Modern
Neoglacial Rates
Of Change
Current
1
2
3
4
5
6
7
8
9
10
11
12
13
14
WARMING CYCLE

Modern Period (the last few hundred years)

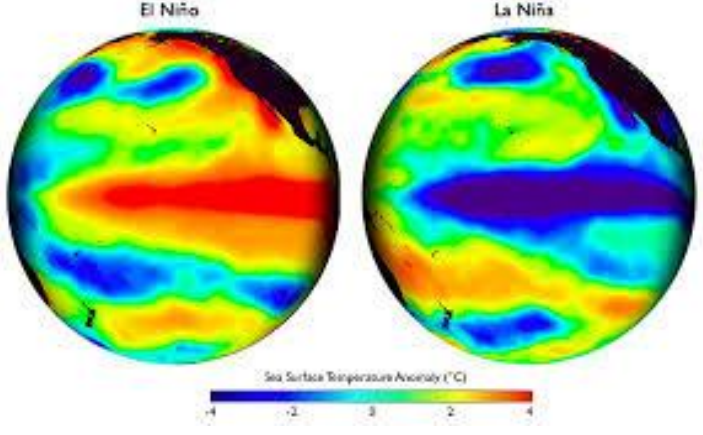


Wikipedia





World Ocean review



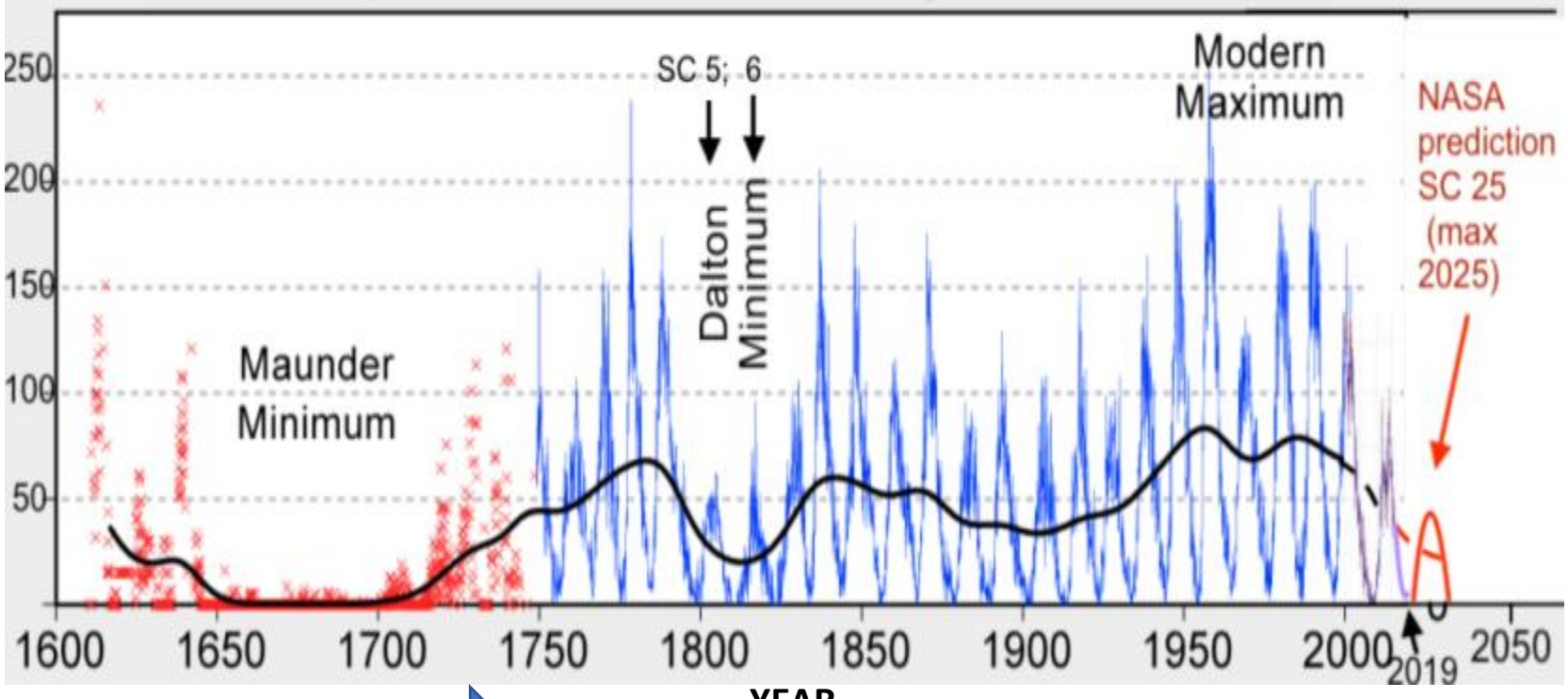
Climate.gov

Modern Period (the last few hundred years)

Climate and Weather are driven by:

- **Solar Cycles**
- **Oceanic Currents**
- **Oceanic Oscillations (Creating lag and a periodic frequency)**
- **Regional Oceanic Energy conditions that drive long term regional pulsating climate variations**

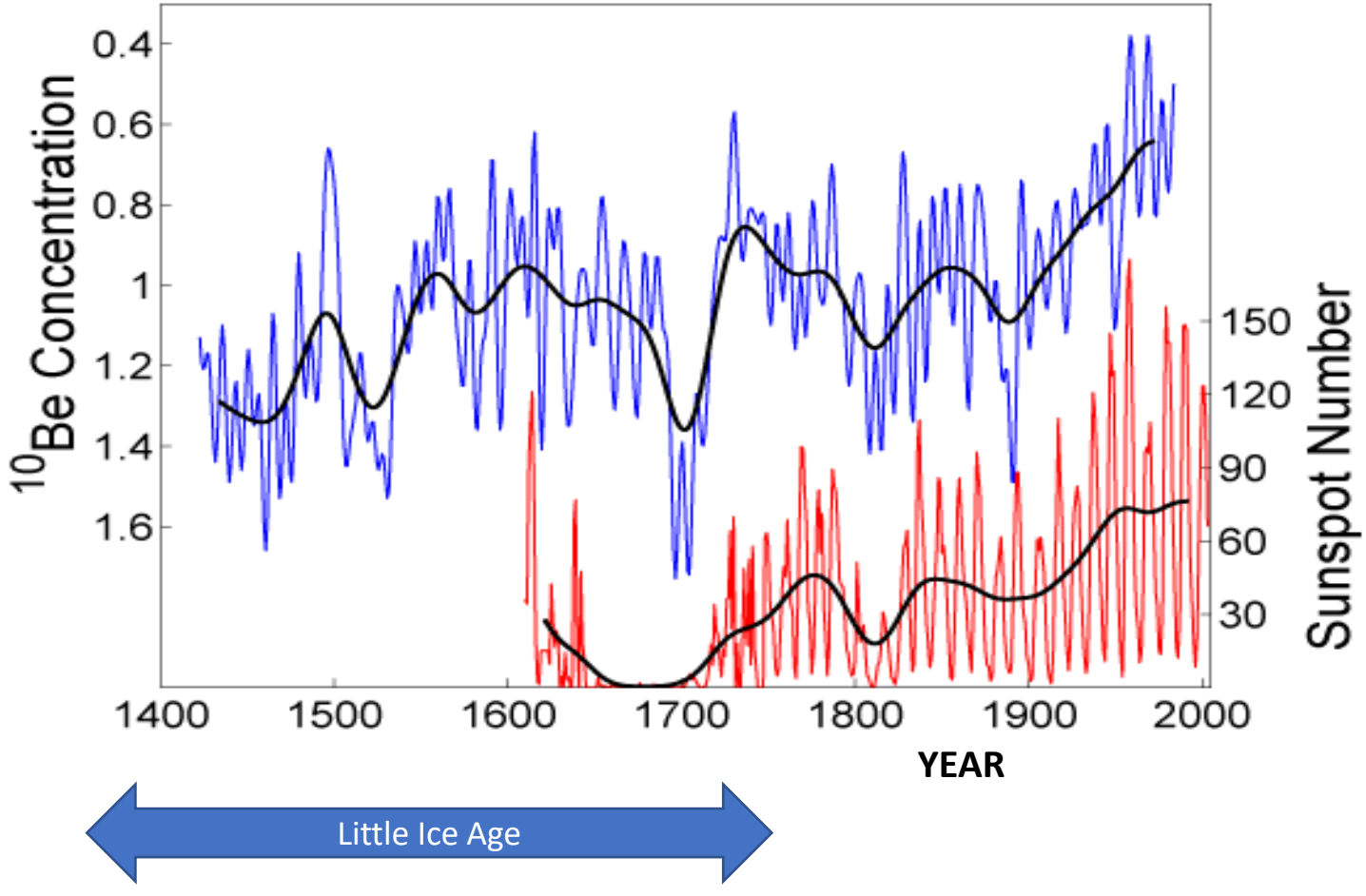
NASA Predicted Solar Cycle 25



Little Ice Age

NASA

Upper Atmospheric ^{10}Be Correlates With Sunspot Activity

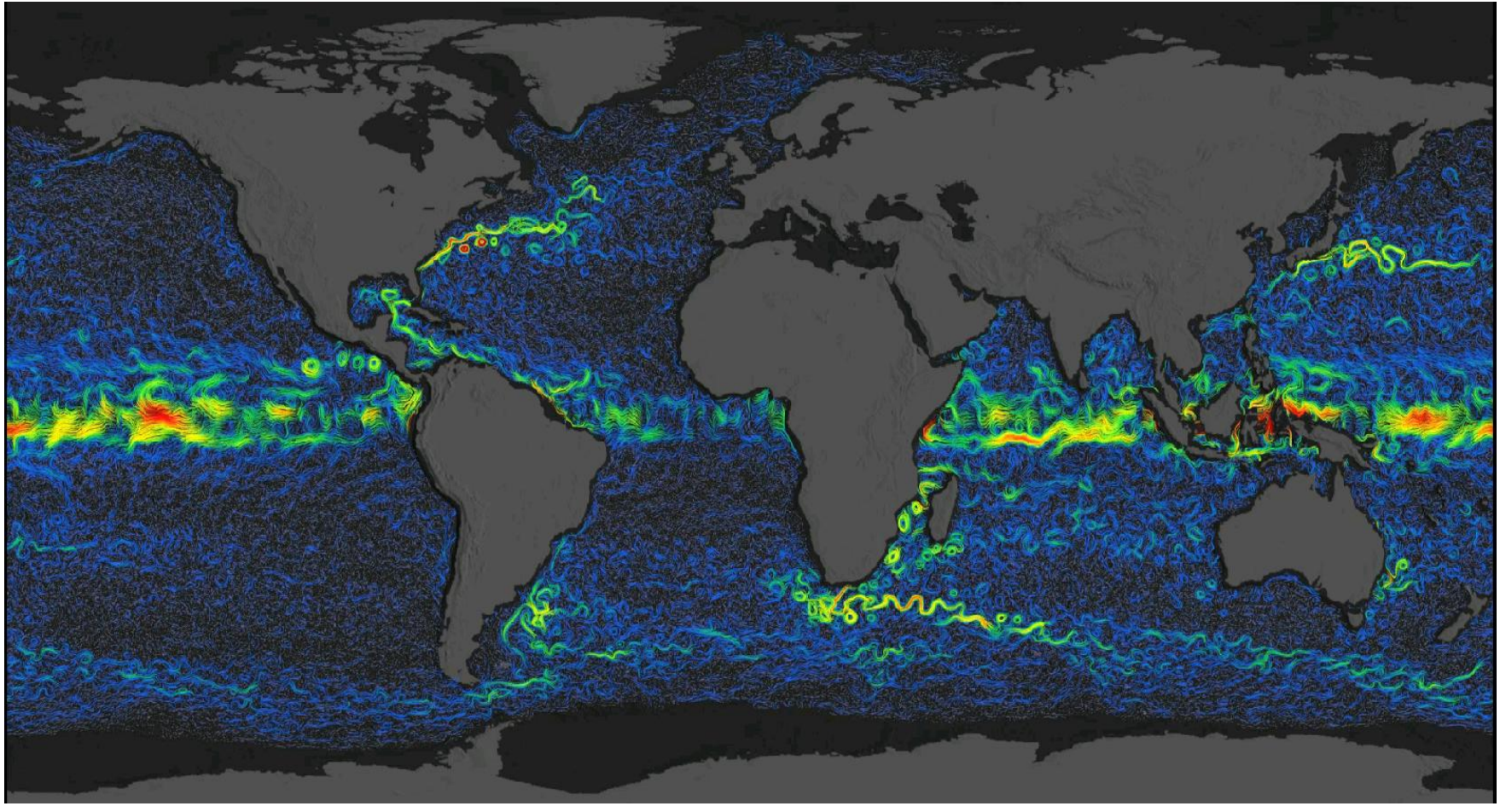


Commons.Wikimedia.org

Today's Ocean Currents and Climate

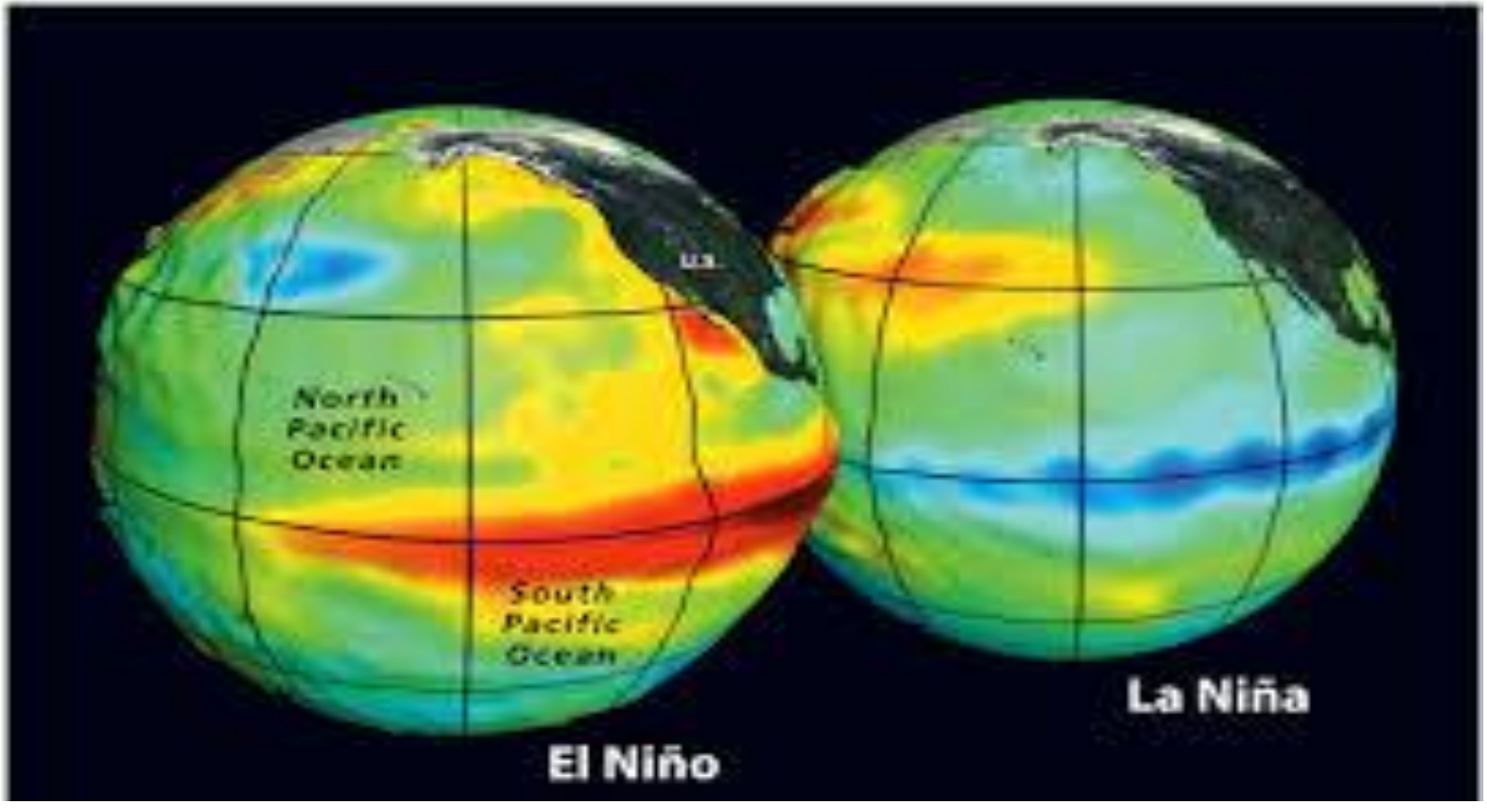
- El Nino Southern Oscillation ENSO
- Pacific Decadal Oscillation PDO
- Japanese Current
- Atlantic Multidecadal Oscillation AMO
- Gulf Stream Current

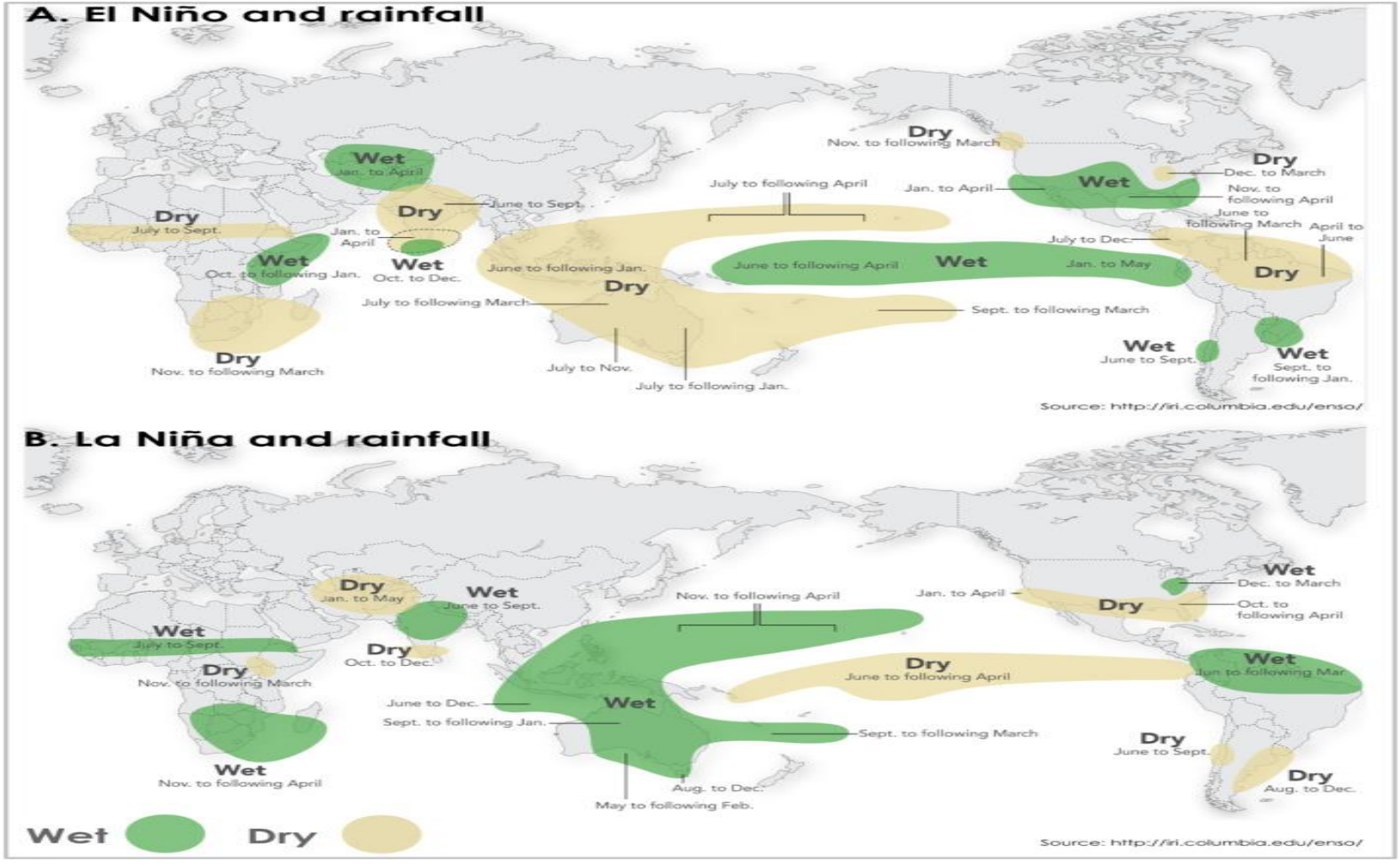
Modern Earth's Ocean Currents



NASA earth Nullschool

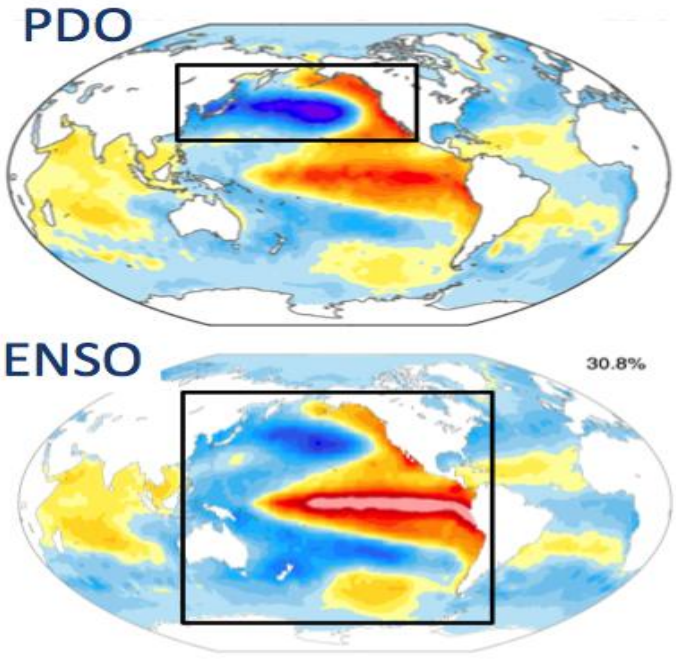
El Nino Vs La Nina Pacific: ENSO Temp

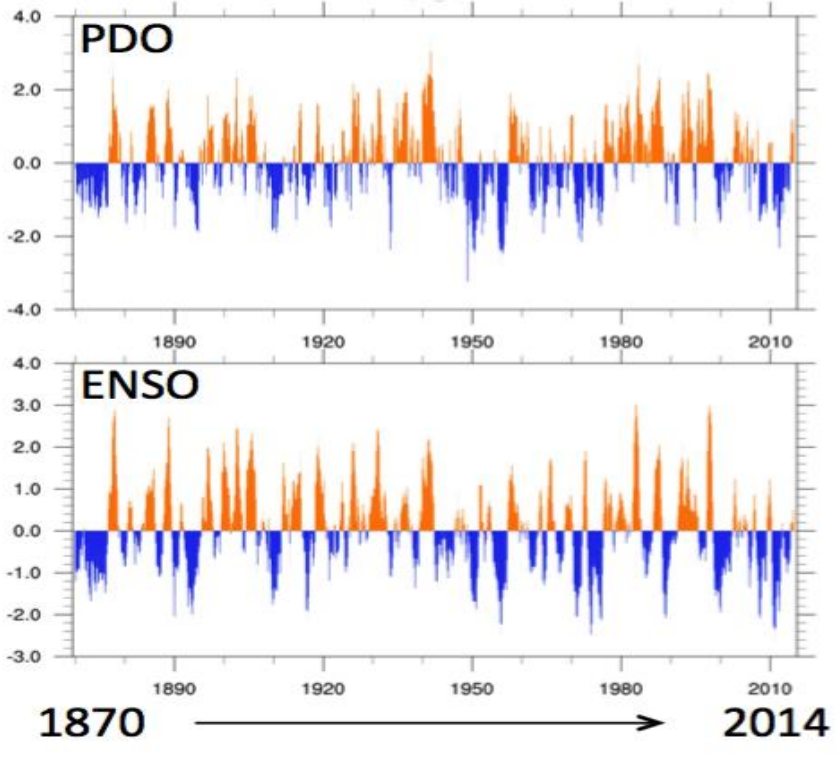




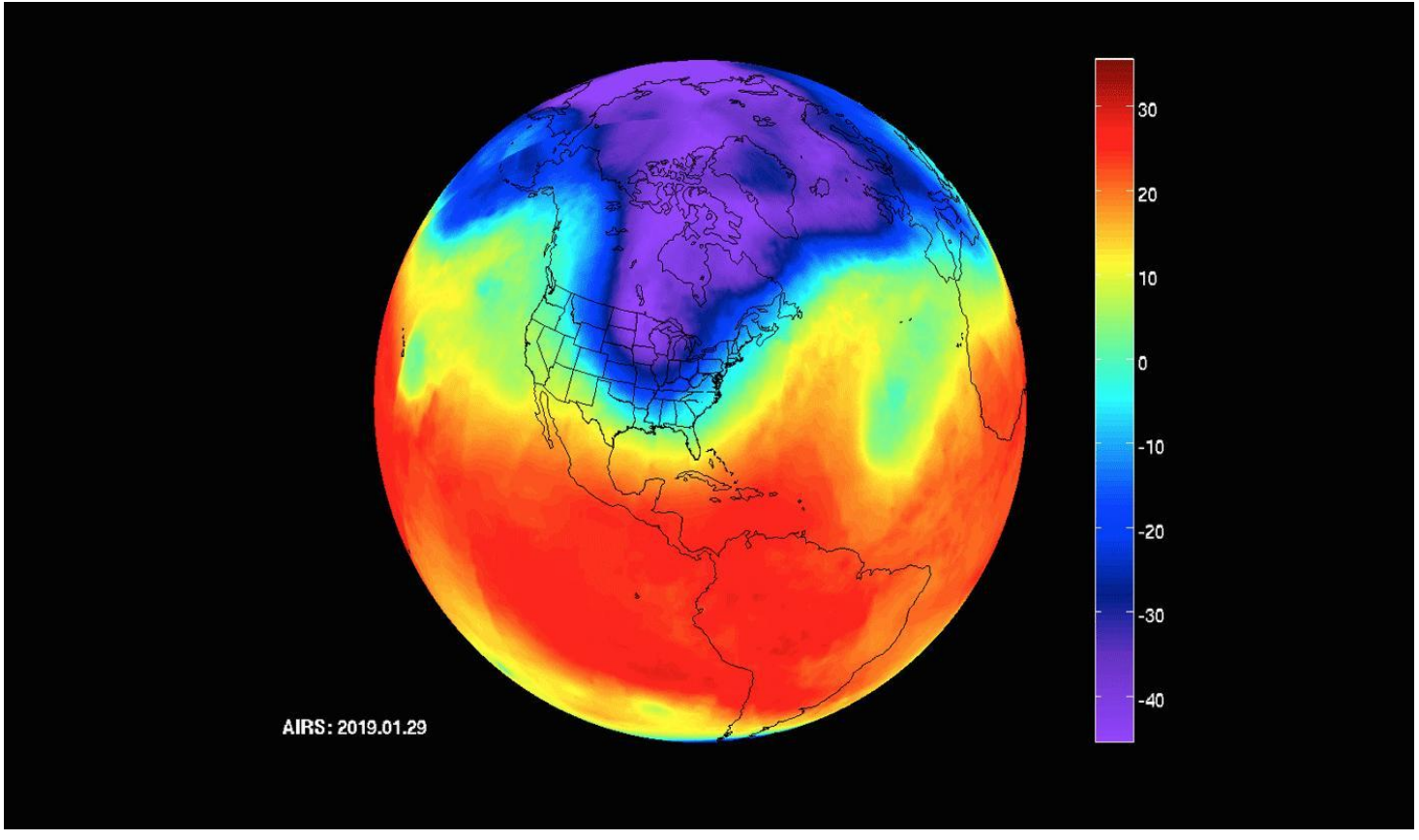
Sciencedirect.com

Pacific Decadal Oscillation PDO
El Nino Southern Oscillation ENSO



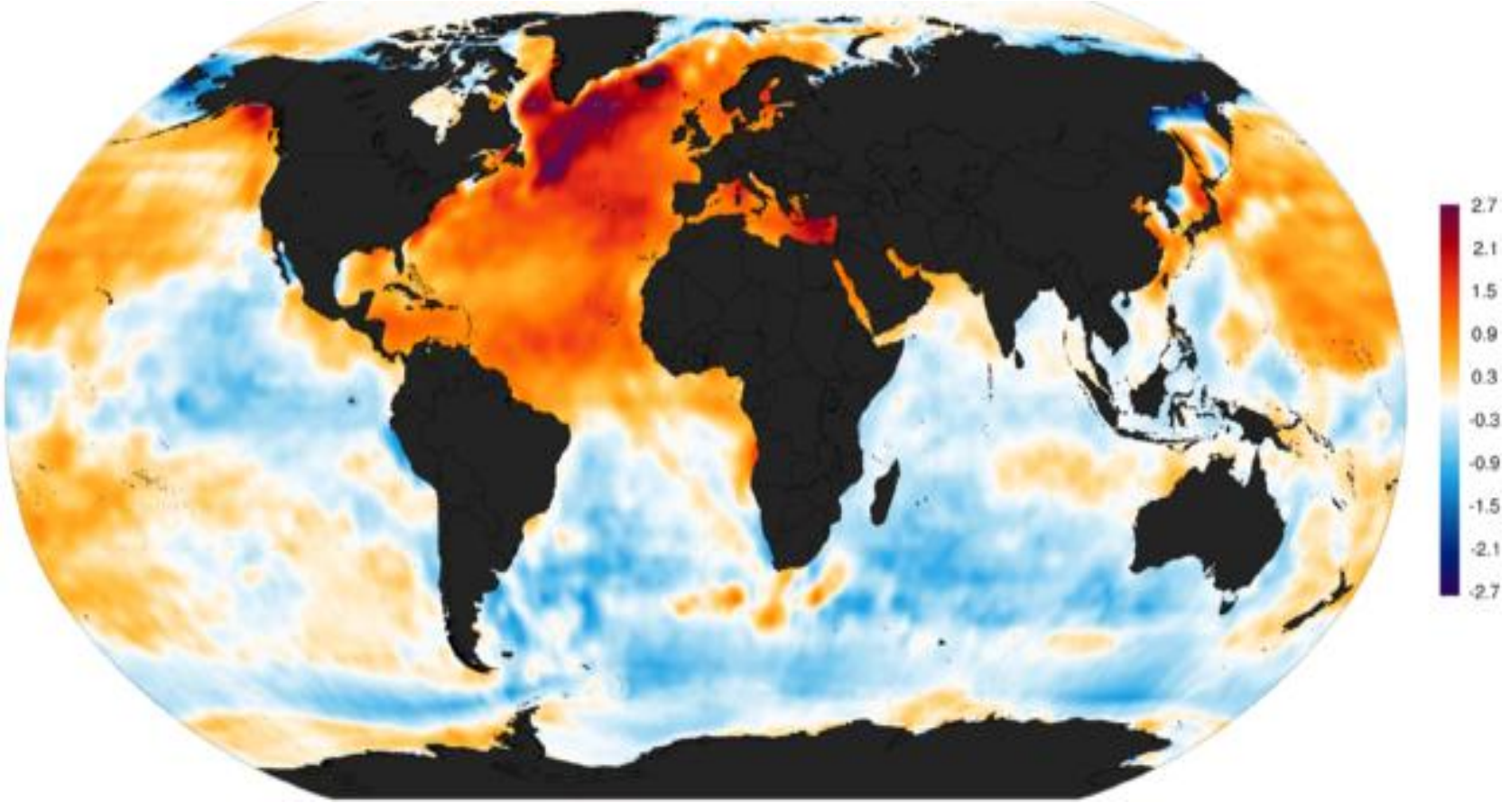


Infrared Image Of Northern Polar Vortex Hole



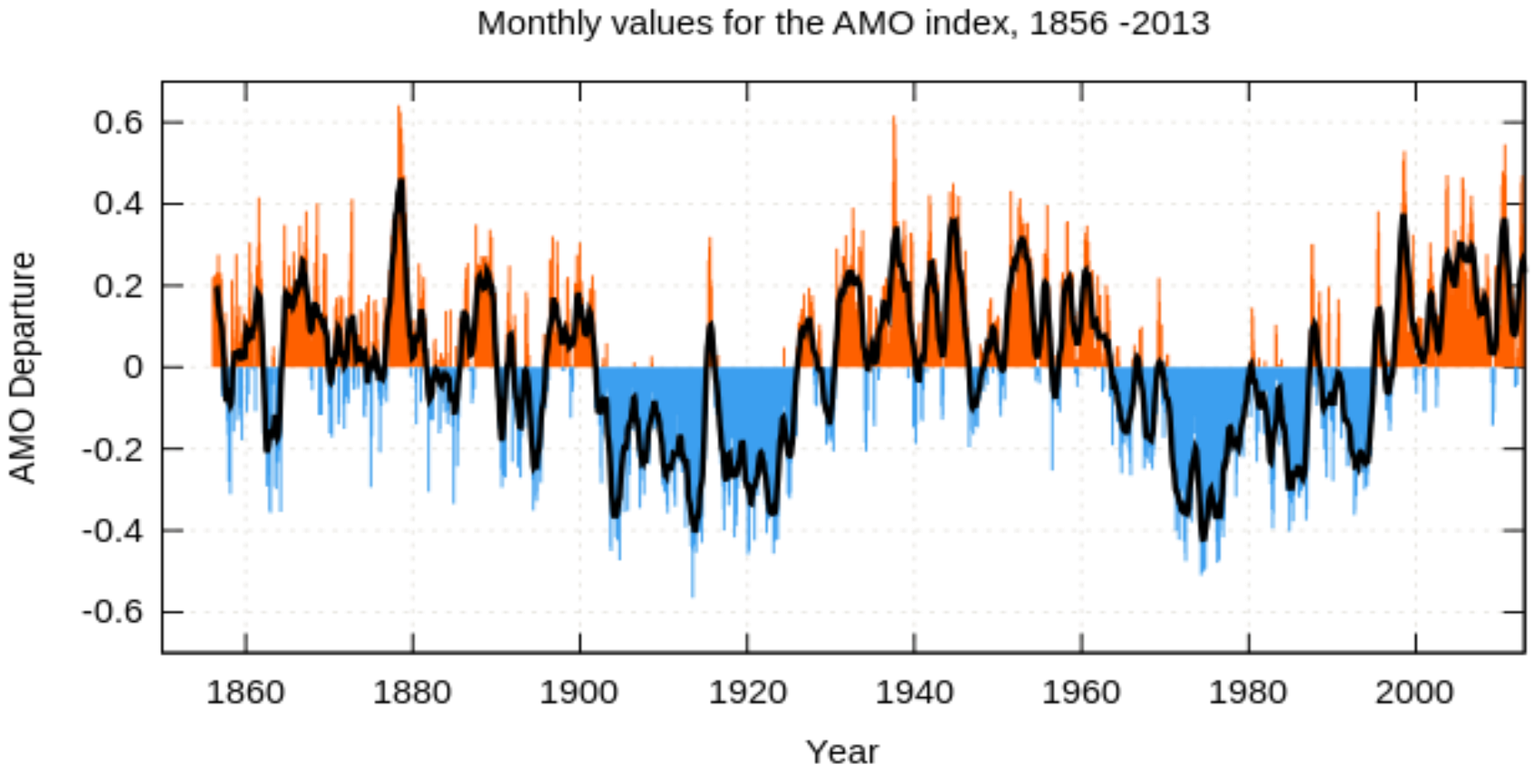
Jan 29, 2019

Atlantic Multidecadal Oscillation (AMO)



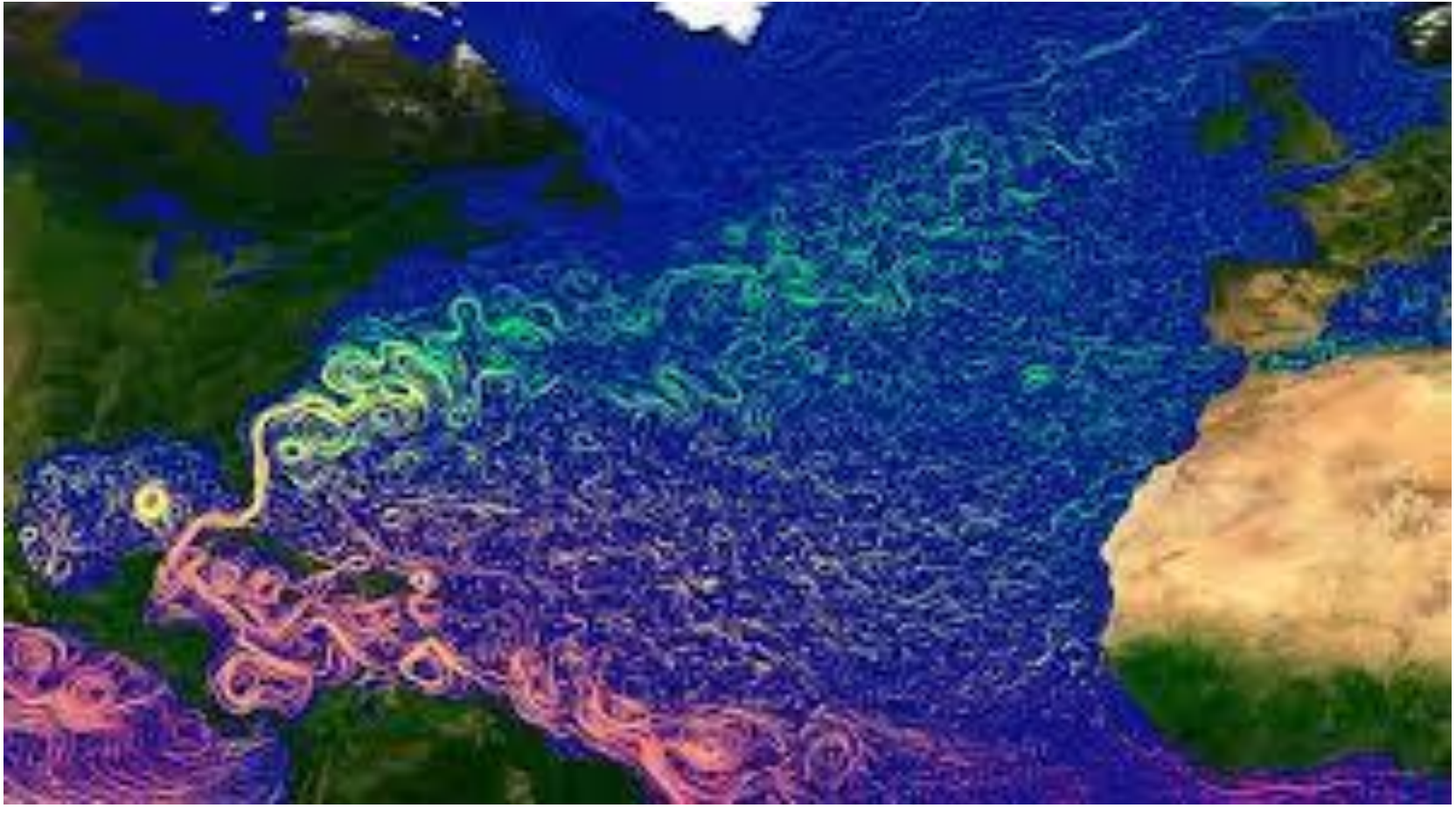
Wikipedia

Atlantic Multidecadal Oscillation (AMO)



WIKIPEDIA

The Gulf Stream and South American Current



Earth NASA nullschool

Paleoclimatology

Climate Change Science badly needs to involve factual information from the Earth Sciences.

"Theory" must be consistent with millions of years of evidence from real data. It is NOT.

Earth Temperature is not controlled by or directly related to CO2 concentration over 200 ppm.

Oceanic energy accumulation, storage and movement have created unique climates throughout earth history. These climates required specific continental positions. Only by Duplicating these conditions could we recreate any similar Temperatures.

Humans have been lucky to live in the Holocene, a small island of warmth in a time dominated by glaciation.

In the Holocene, there is nothing unusual about our current Rate Of Warming.

Embrace the warmer, humid, "CO_2 - fertilized times" now.

Prepare for more glaciation ahead.

Man Is Not Causing A "Climate Emergency"

We Must Learn To Adapt To Naturally-Occurring Climate Changes

Enjoy The Warmth (While We Have It)!

THE END

YouTube Videos With More Information:

Paleoclimatology Part 1 https://youtu.be/K6tWEjkEiZU

Paleoclimatology Part 2 https://youtu.be/iZSYSWPYEbU

Paleoclimatology Part 3 https://youtu.be/YMHKt9ylPpQ