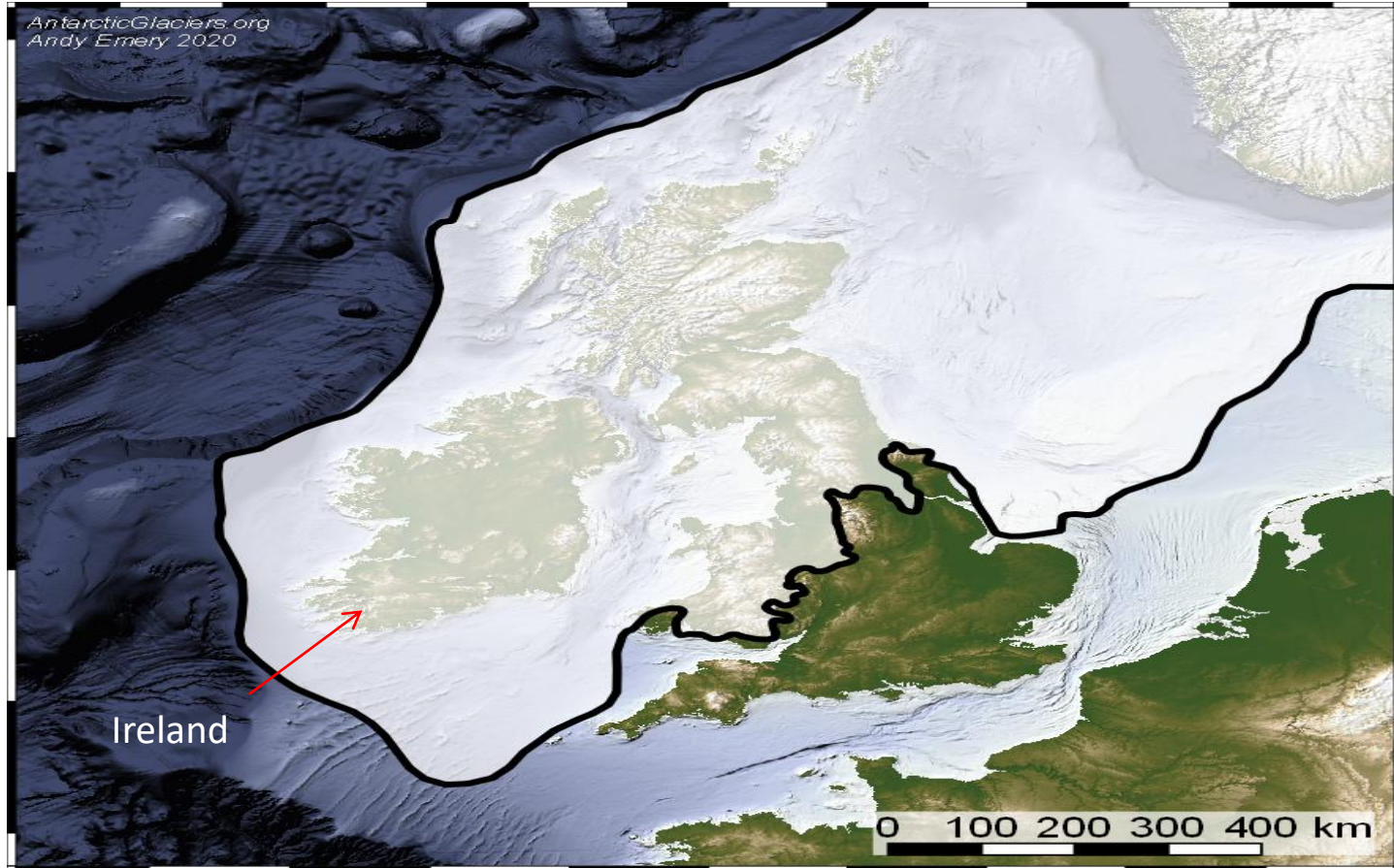


LESSONS FROM PALEOCLIMATOLOGY – Conveniently Ignored By The IPCC

April 20, 2022

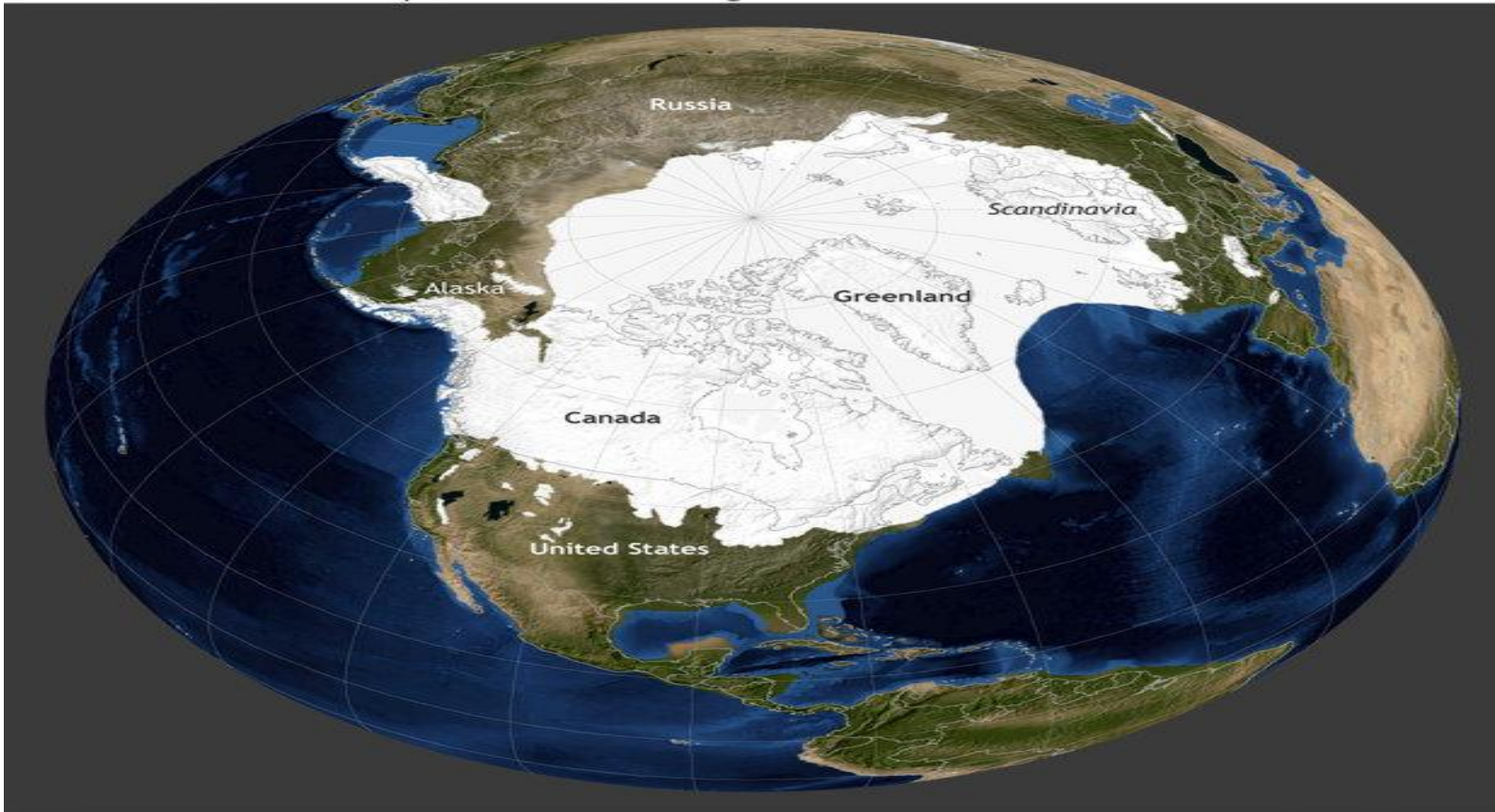


Ireland Beneath The Ice 20,000 Years Ago



Northern Hemisphere Glaciers During The Last Ice Age

Ice sheet extent near the peak of the last ice age



19,000 BC

NOAA Climate.gov
Data: NOAA SOS

19,000 years ago

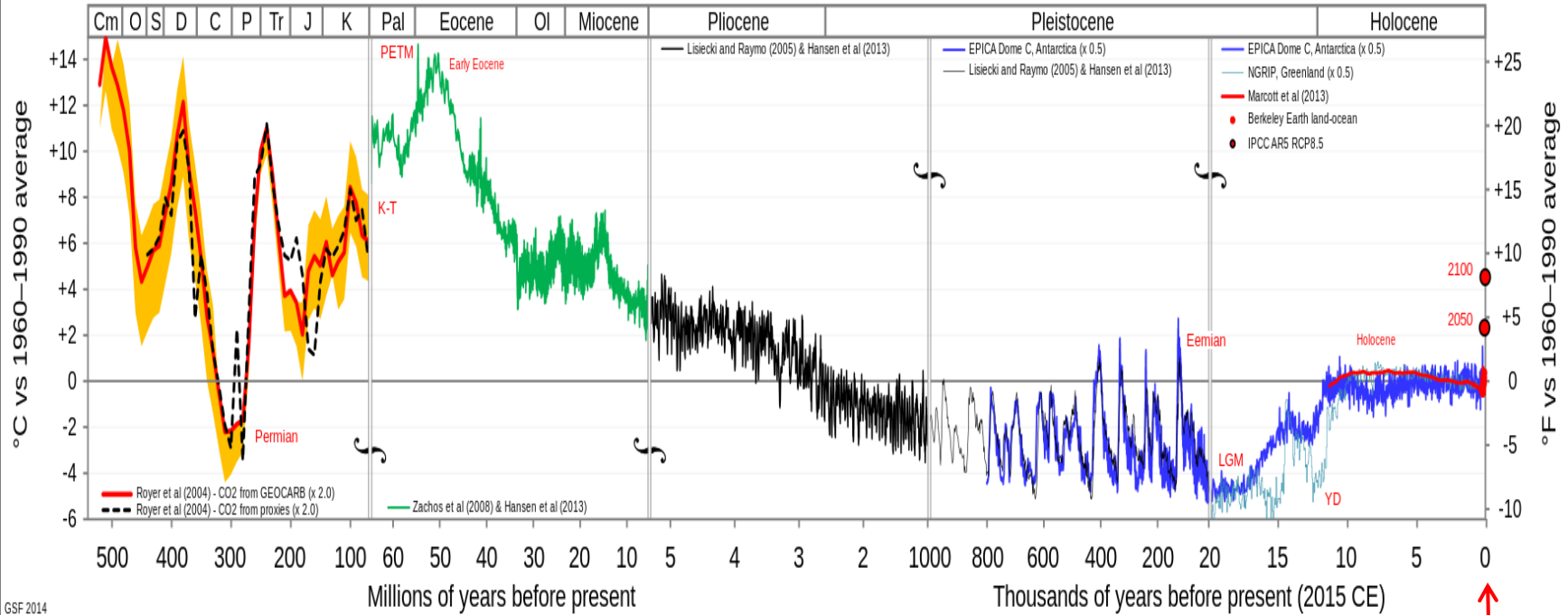
NOAA

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*)

Temperature of Planet Earth



GSF 2014

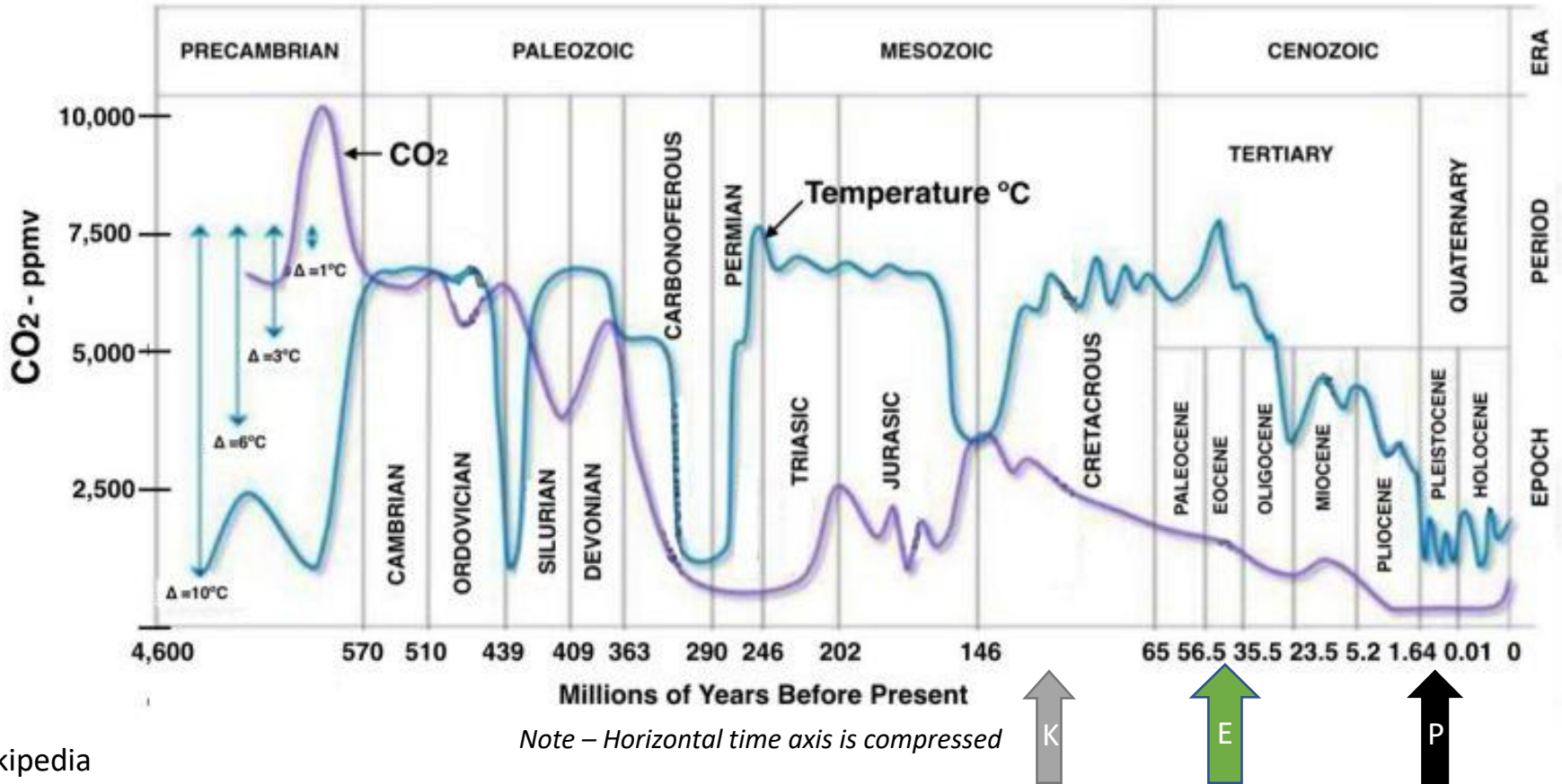
Wikimedia

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

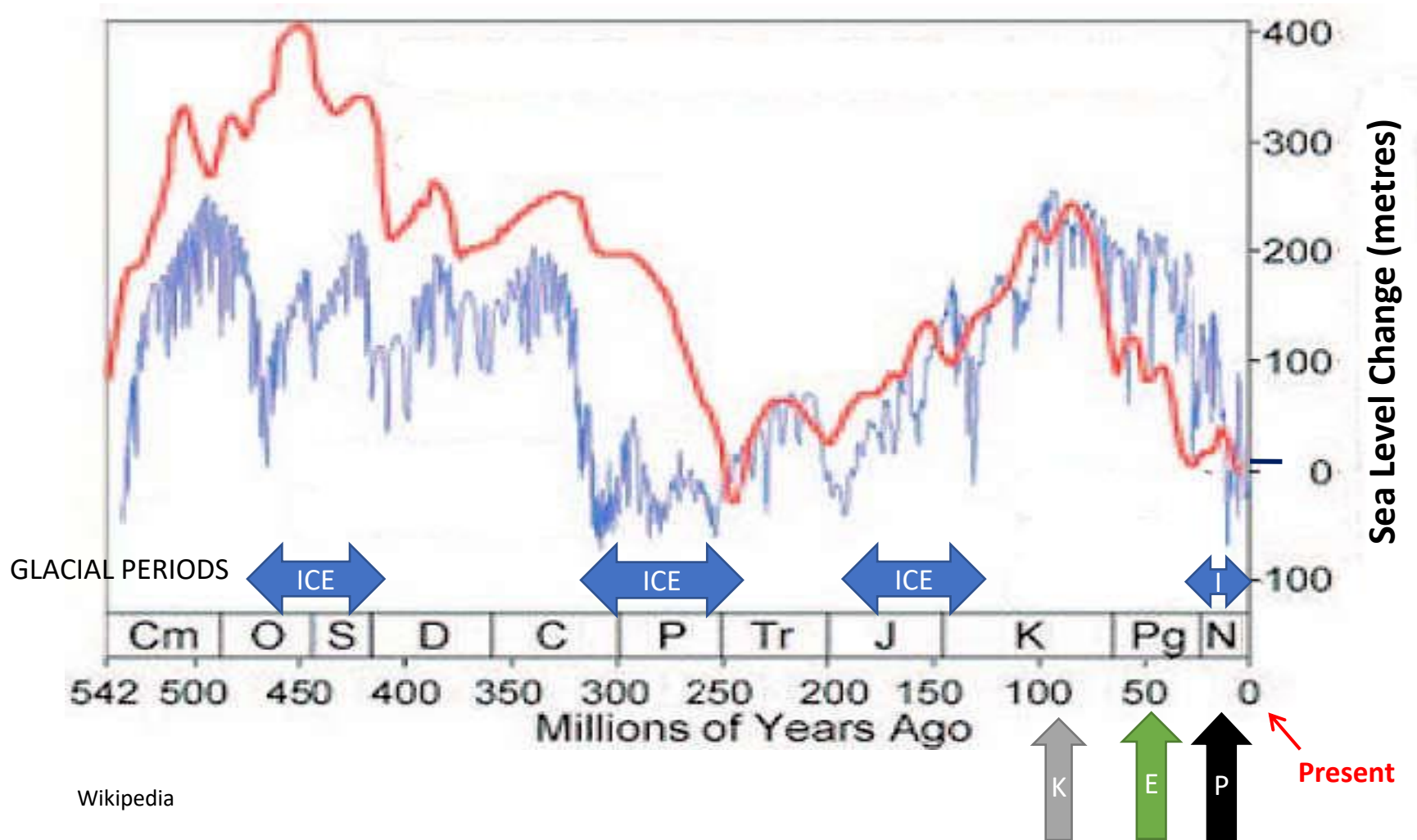
Present

Temperature And Atmospheric CO₂ Over Earth's History

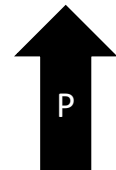
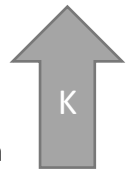
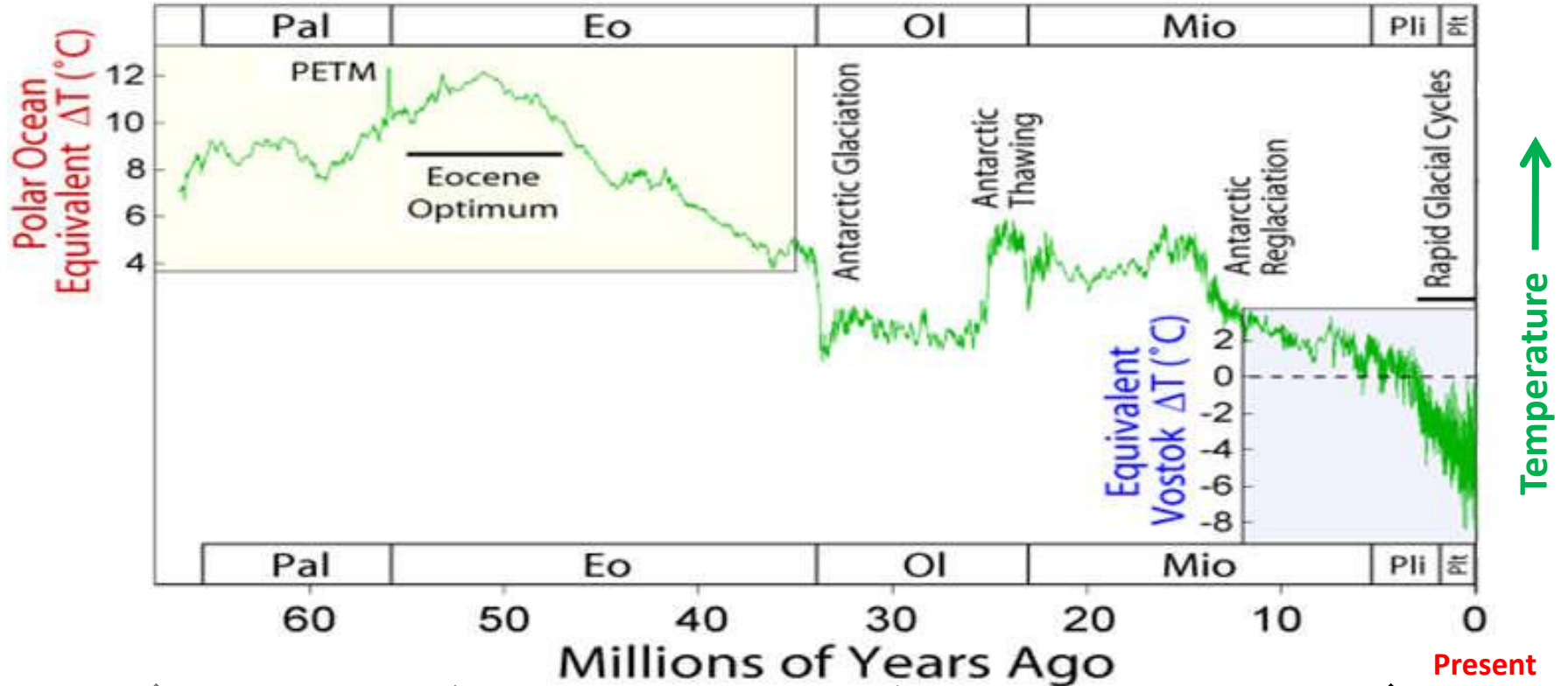
Present



SEA Level and Glacial Periods in GeoHistory

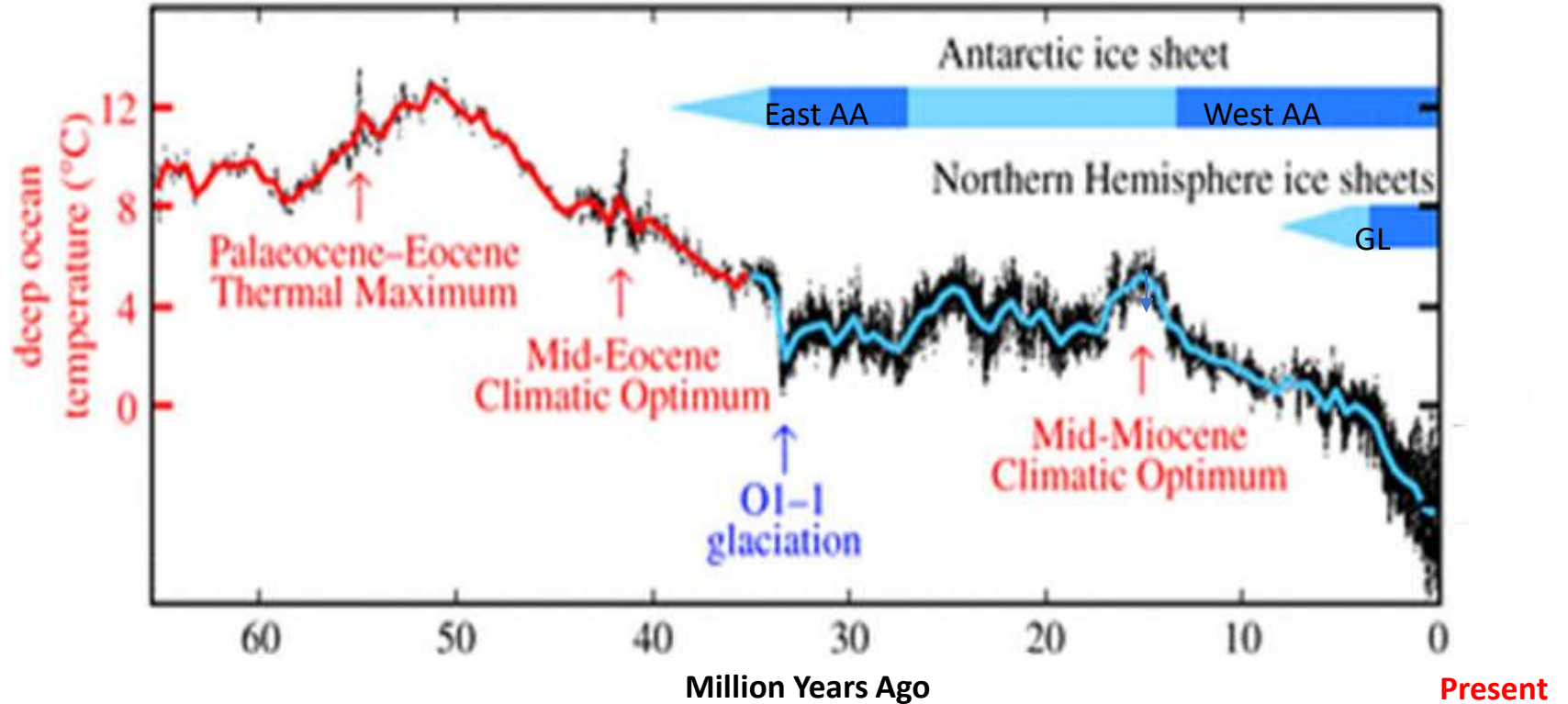


Earth Temperature Proxies Since the Dinosaur Extinction



Glaciations During The Past 34 Million Years

18 C



E

O

M

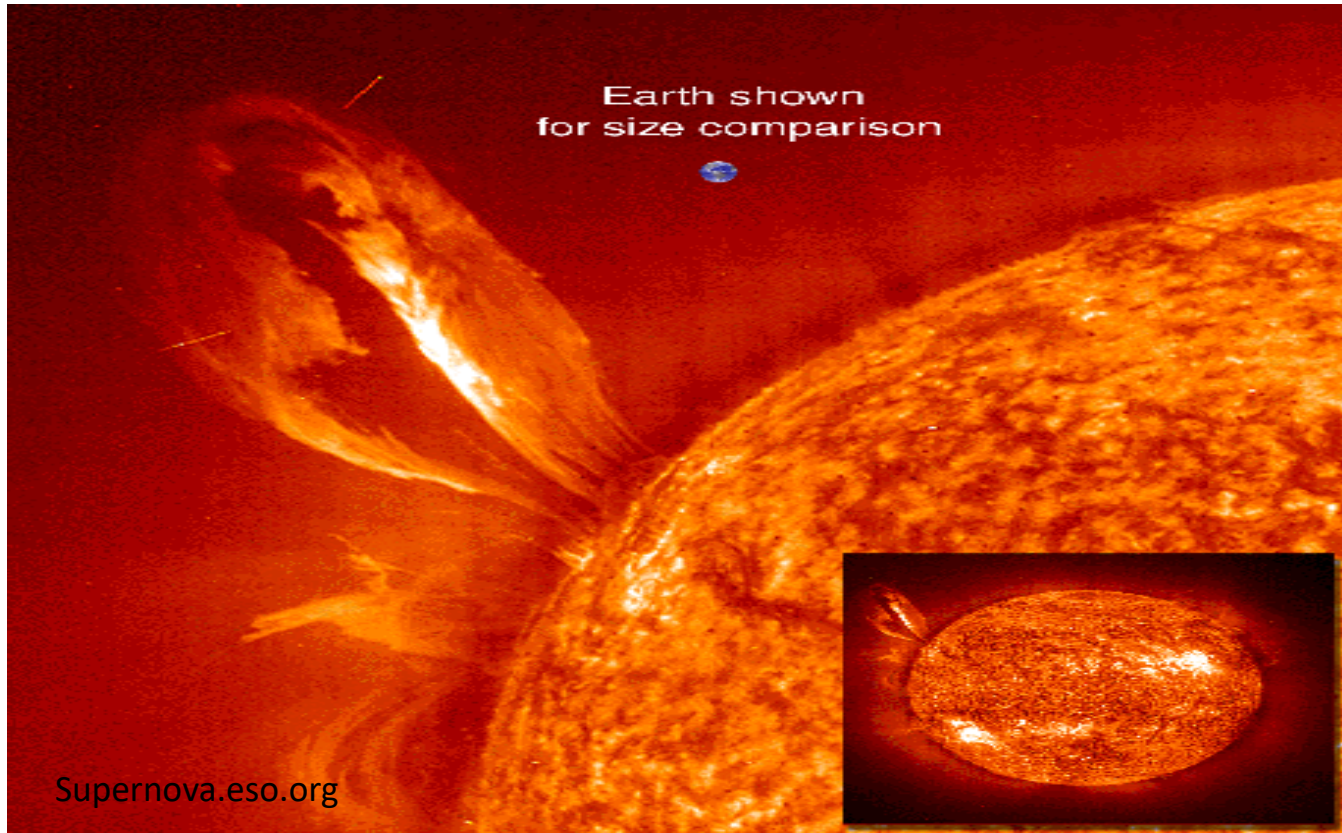
P

What has caused this dramatic fall in temperature?

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

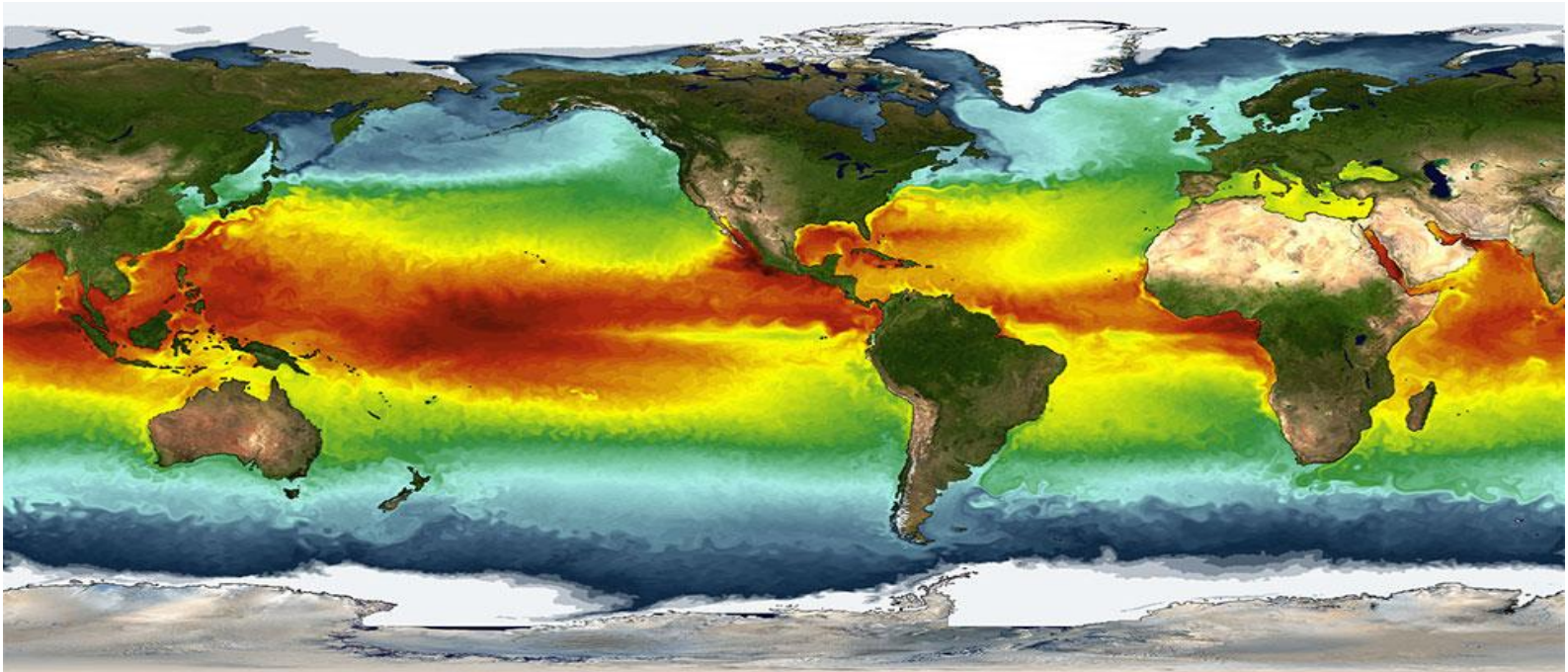
SOLAR

The Sun: is the primary energy source for climate.



The Sun: is the primary energy source for climate.

Oceans: the primary energy “storage” mechanism.

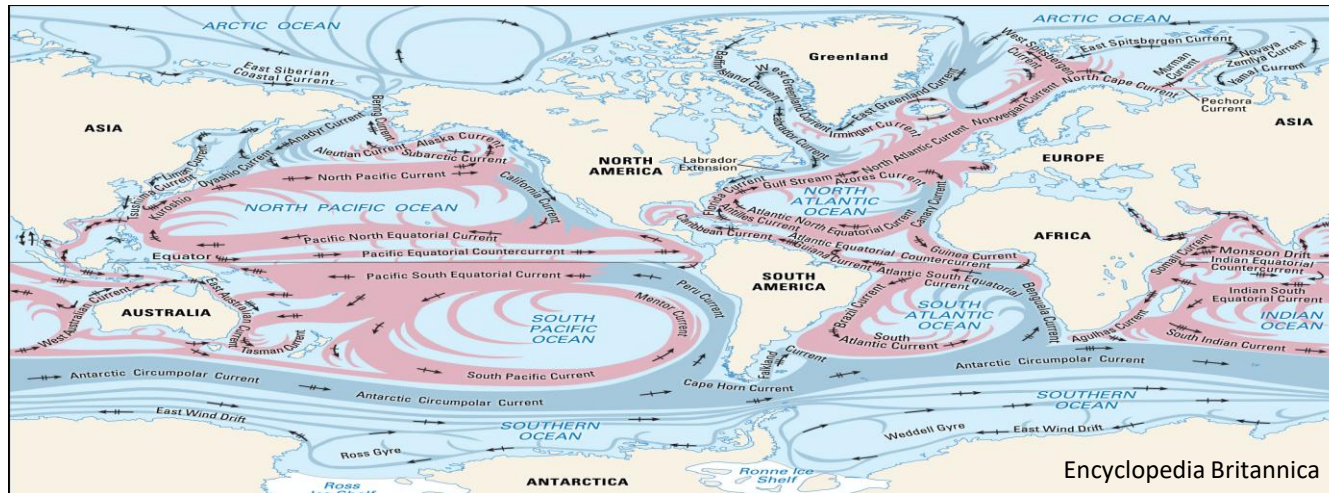


NOAA

The Sun: is the primary energy source for climate.

Oceans: the primary energy “storage” mechanism.

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



The Sun: is the primary energy source for climate.

Oceans: the primary energy “storage” mechanism.

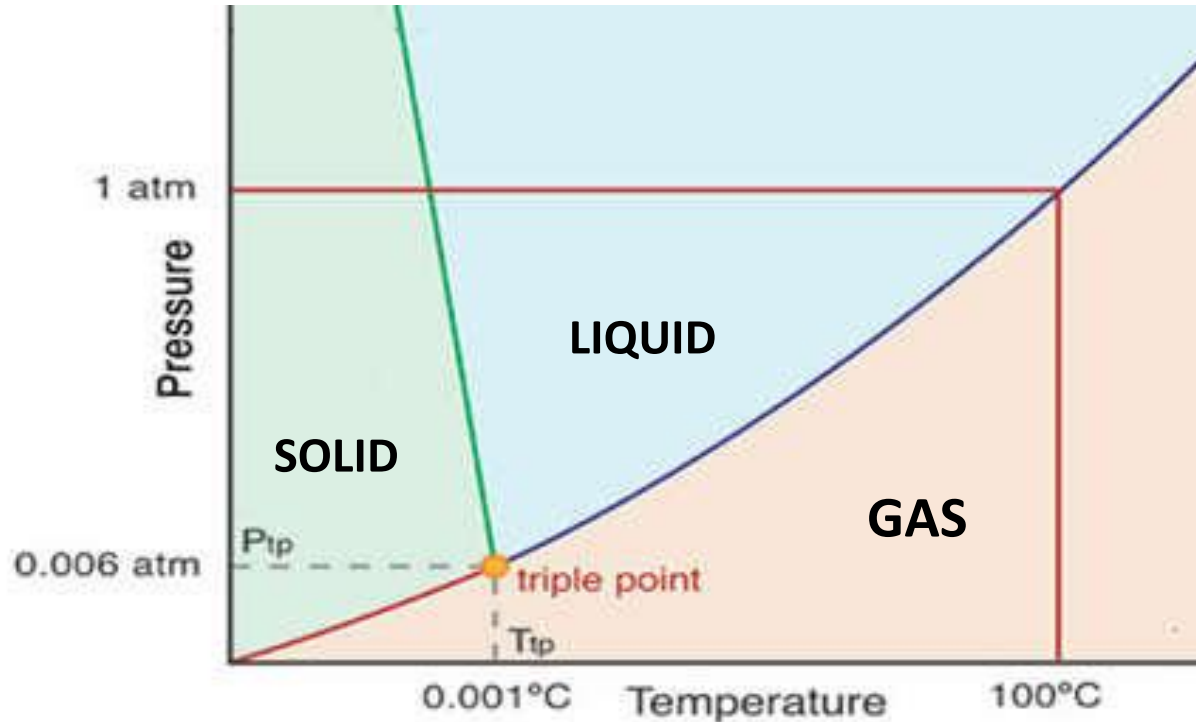
Ocean Currents: the primary energy “transport” and “collection” vehicle.

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

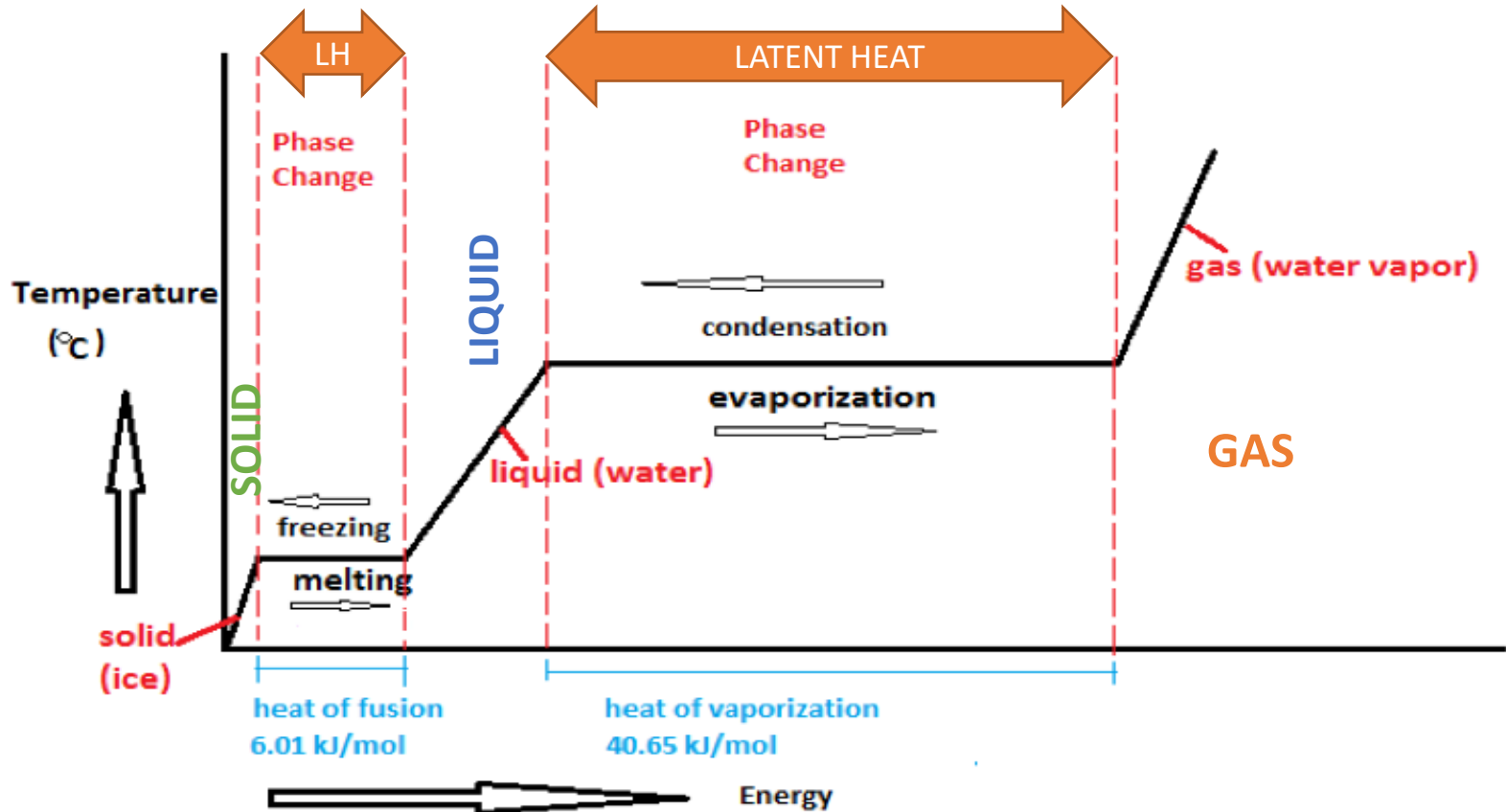


Pratik Shukla (Nightingale)

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



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



Changes To Ocean Currents

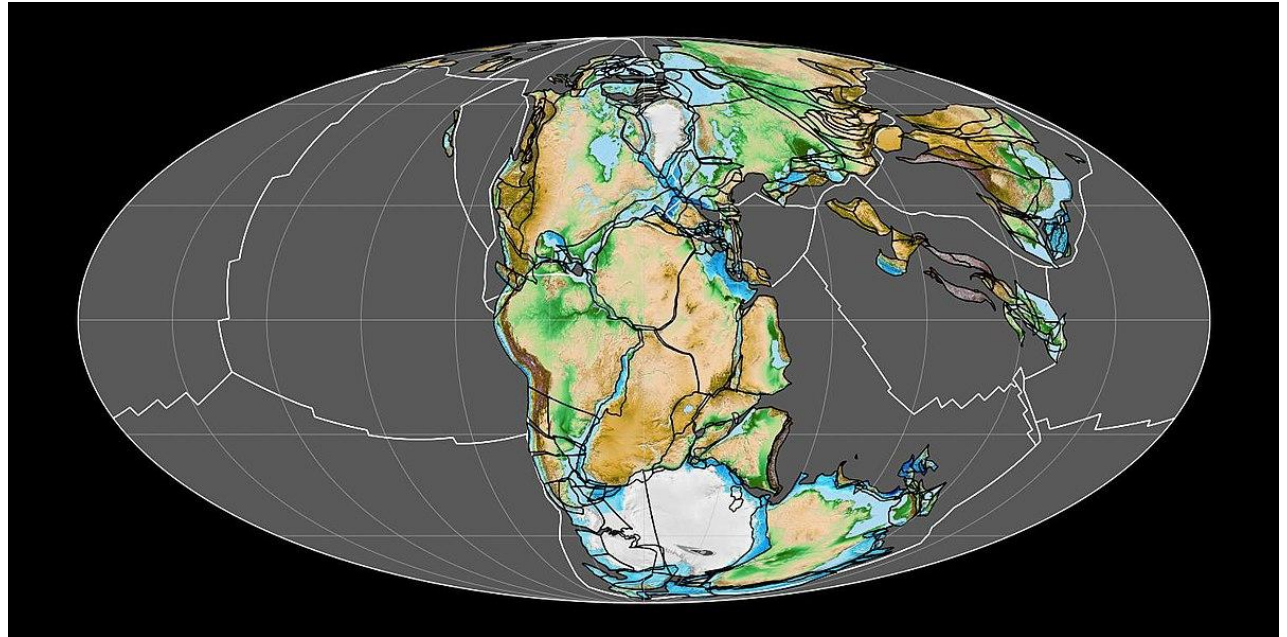
As continents have drifted, ocean passages have opened and closed over time.

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”

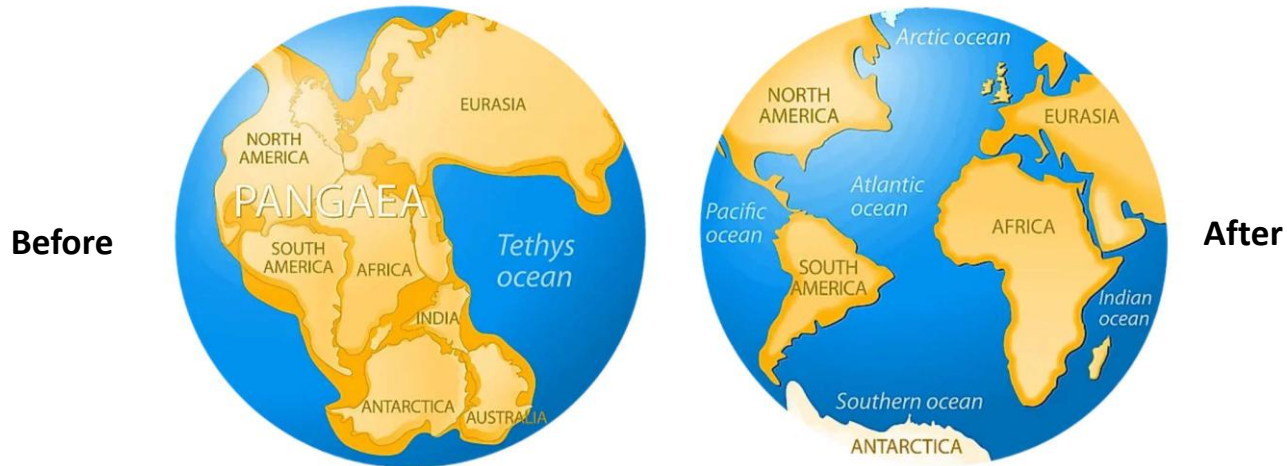


Physical Changes To The Earth

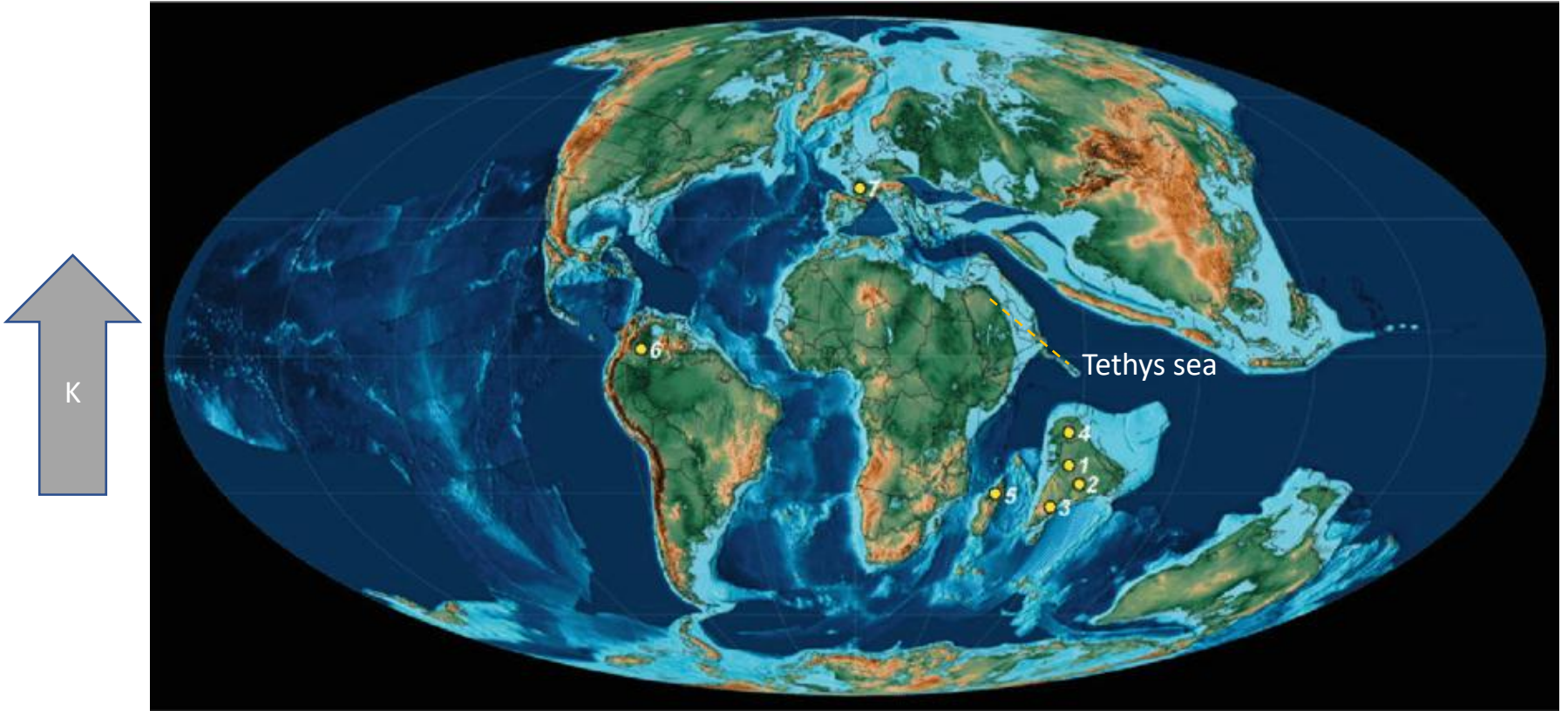
Pangaea – the “super continent”

Surrounded by the Tethys Sea

Pangaea break-up began 175 million years ago



Late Cretaceous Period – 66 Million Years Ago

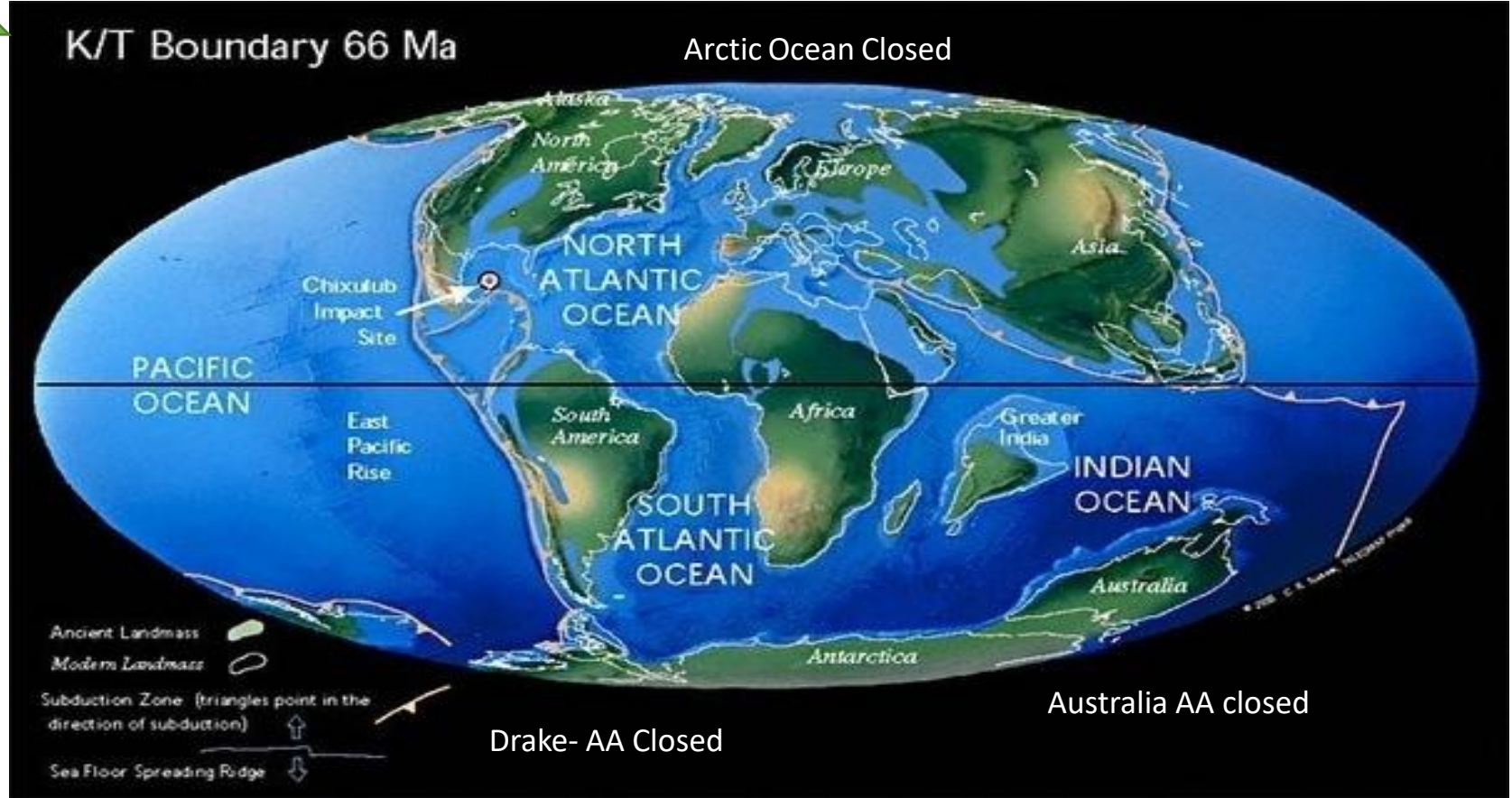


EOCENE 56 Million Years Ago

No Polar Ice Caps

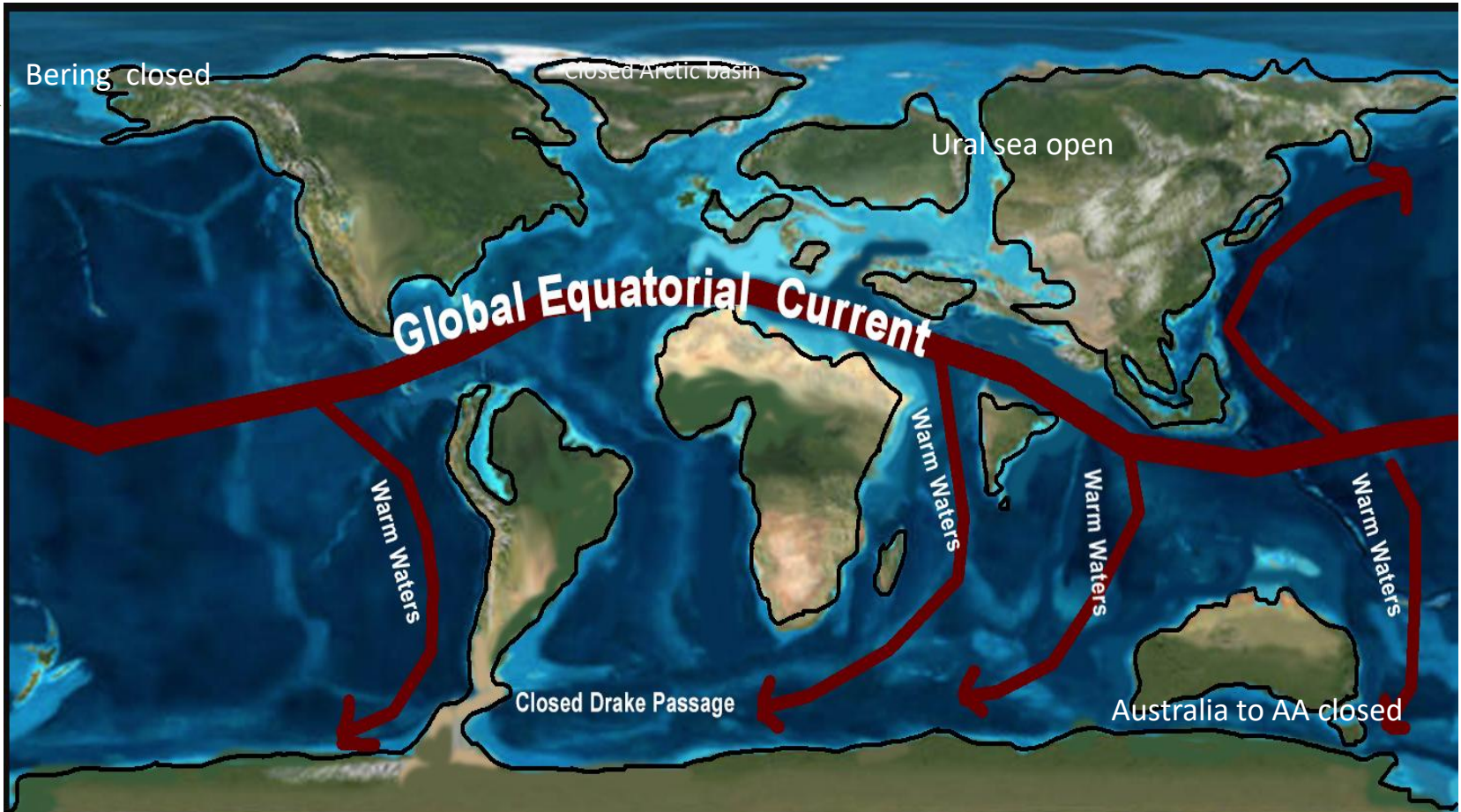
K/T Boundary 66 Ma

Arctic Ocean Closed



E

Eocene 56 MYA Ocean Currents & Connections

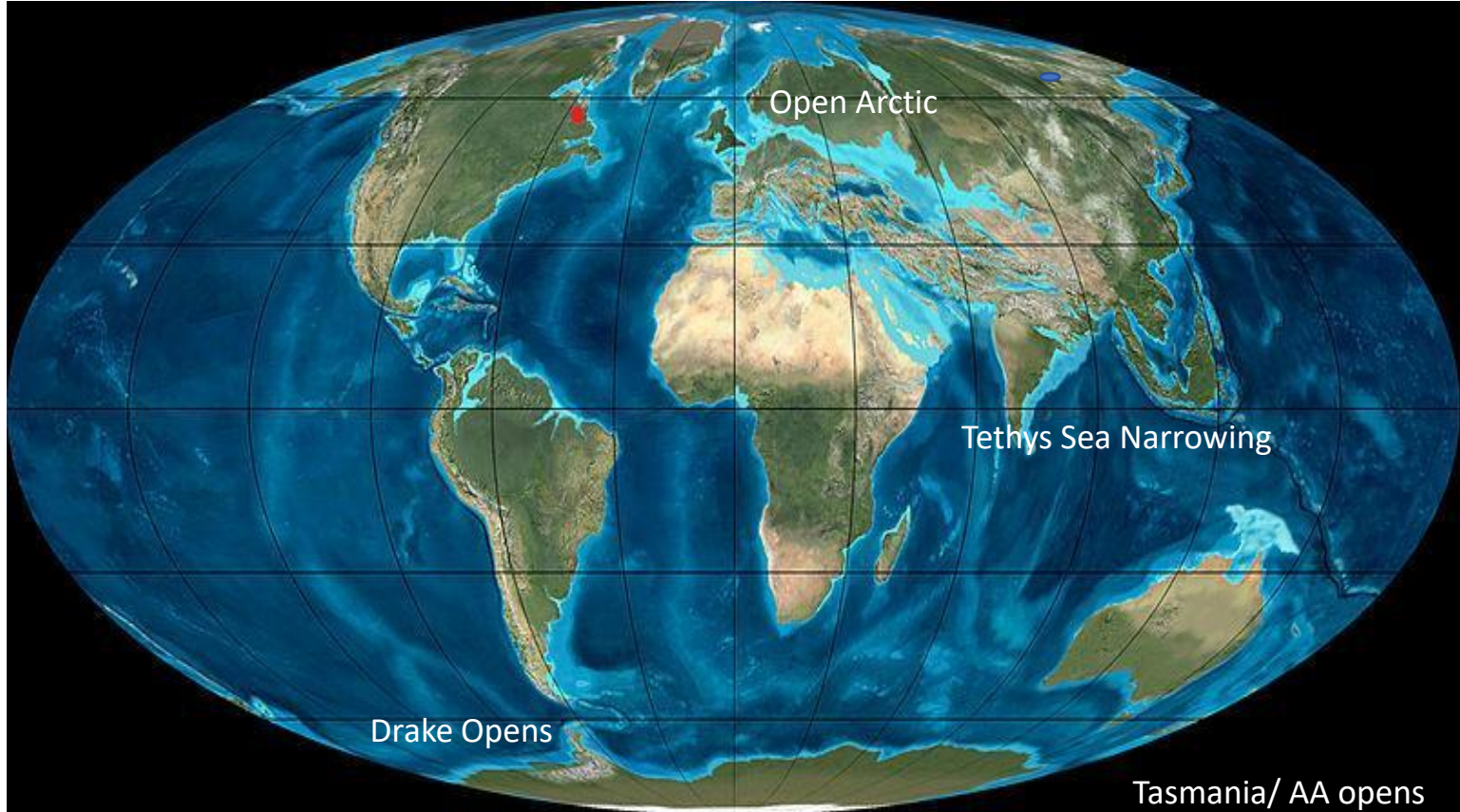


Oligocene – 34 Million Years Ago

Closure of Equatorial Current passages

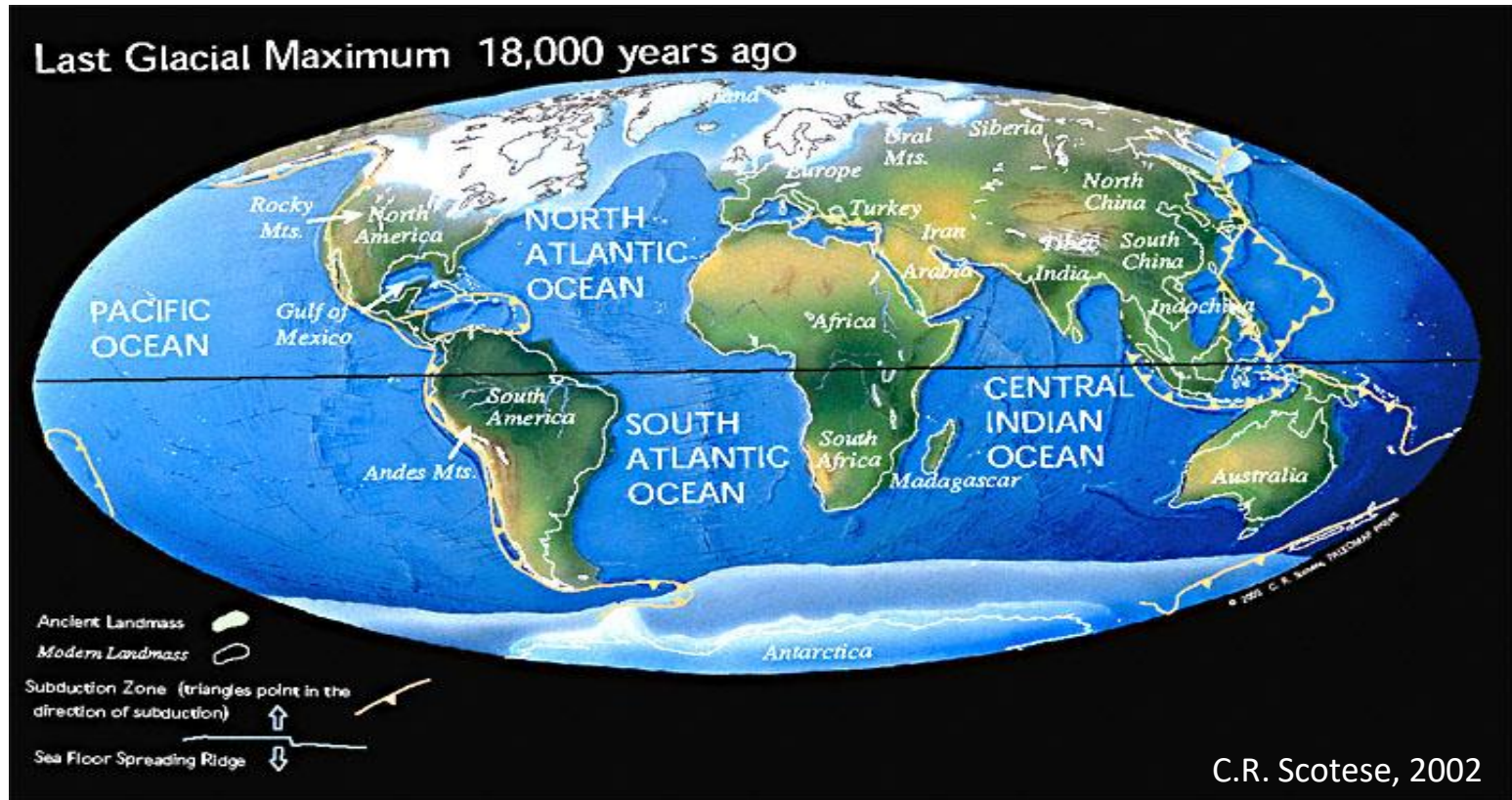
Opening of Southern Polar Currents

No northern Ice Cap



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

Panama and Indonesia Closure, terminating Equatorial Current



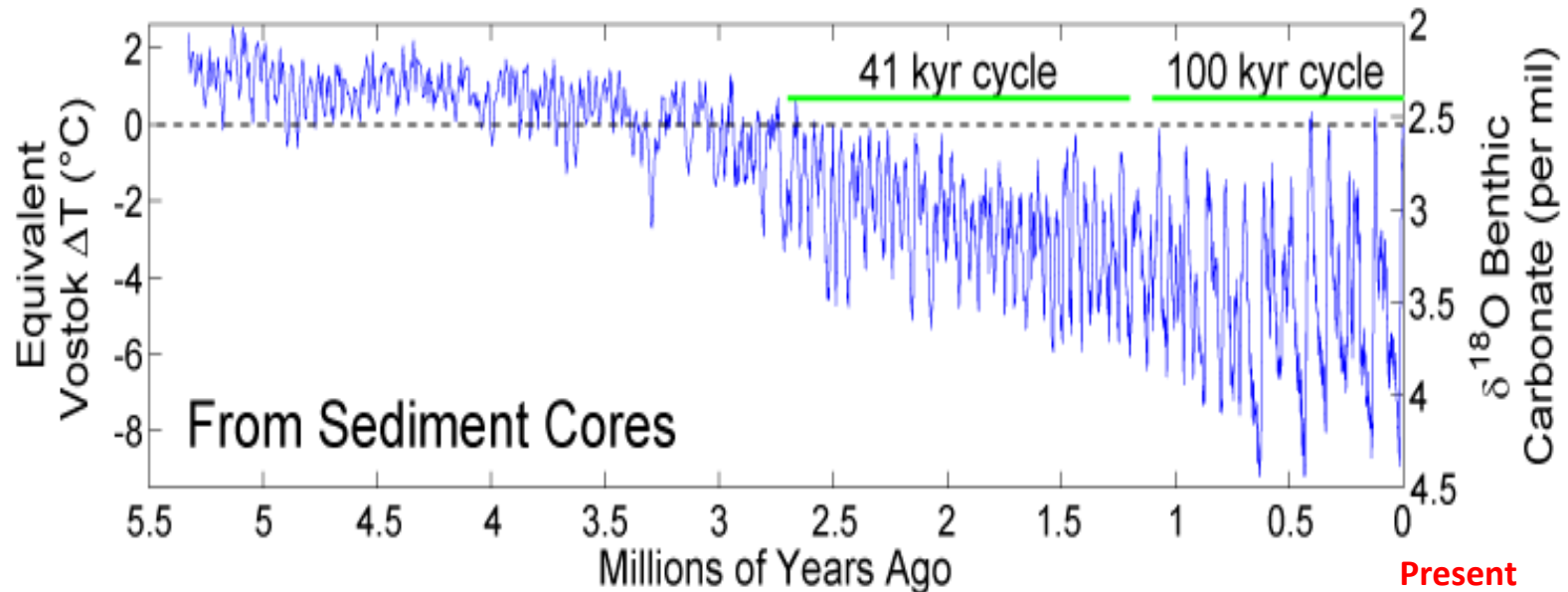
Isthmus of Panama Closes 3.3 MYA



NASA

THE LAST 5 MILLION YEARS

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



**Panama
Closes**



Solar Cycles and sinking temperatures

THE PLEISTOCENE

GLACIAL ICE Control COLD STORAGE 3.3 MYA

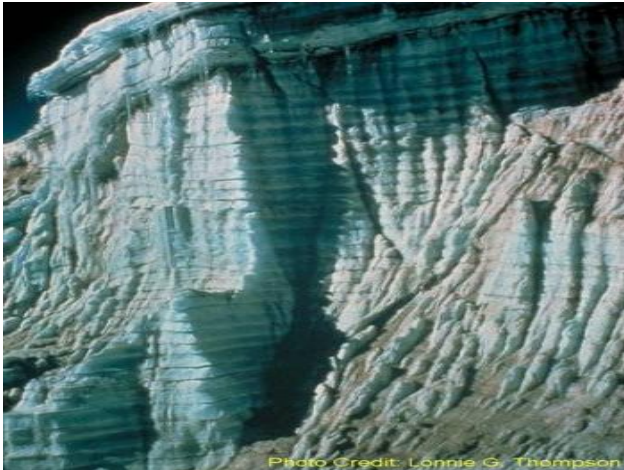


Photo credit: Lonnie G. Thompson



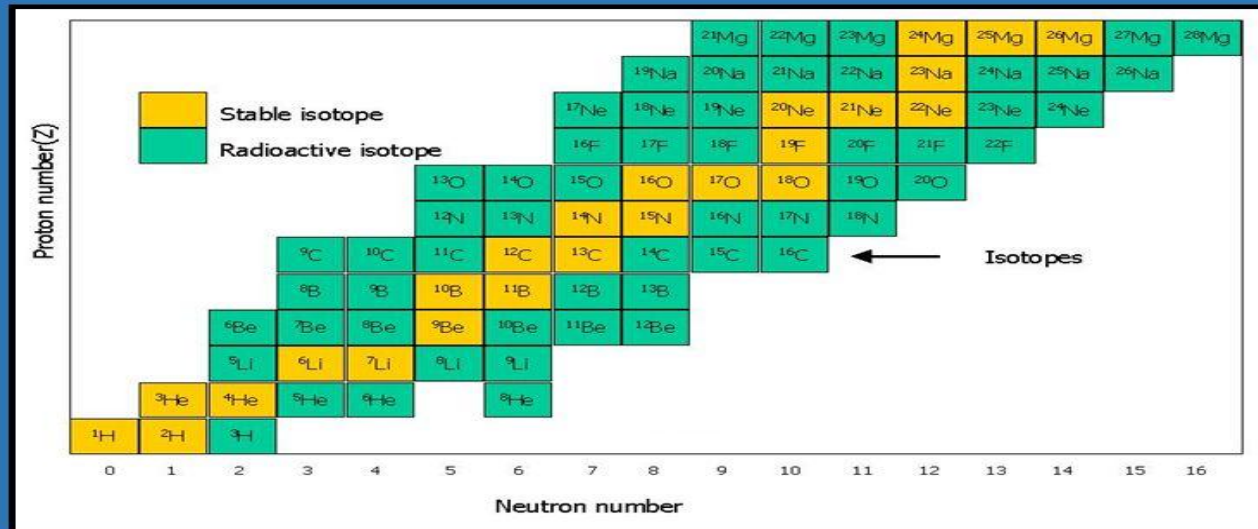
NEW DATA RESOURCE

Proxy data from several sources and techniques.

Stable Isotopes

Slideplayer

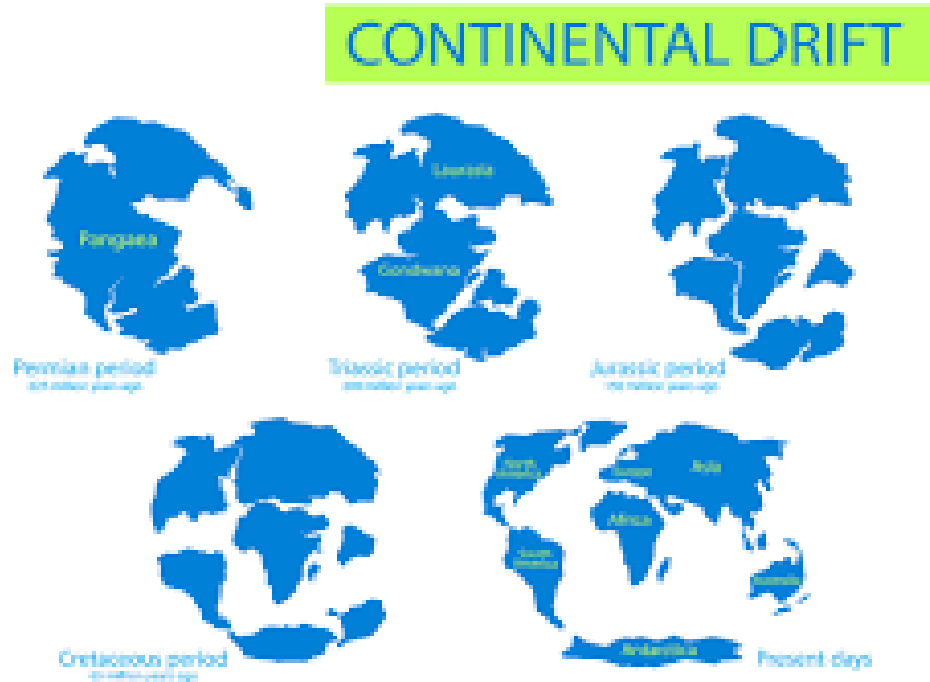
Many different isotopes



NEW DATA RESOURCE

Proxy data from several sources and techniques.

Continental Drift



NEW DATA RESOURCE

Proxy data from several sources and techniques.

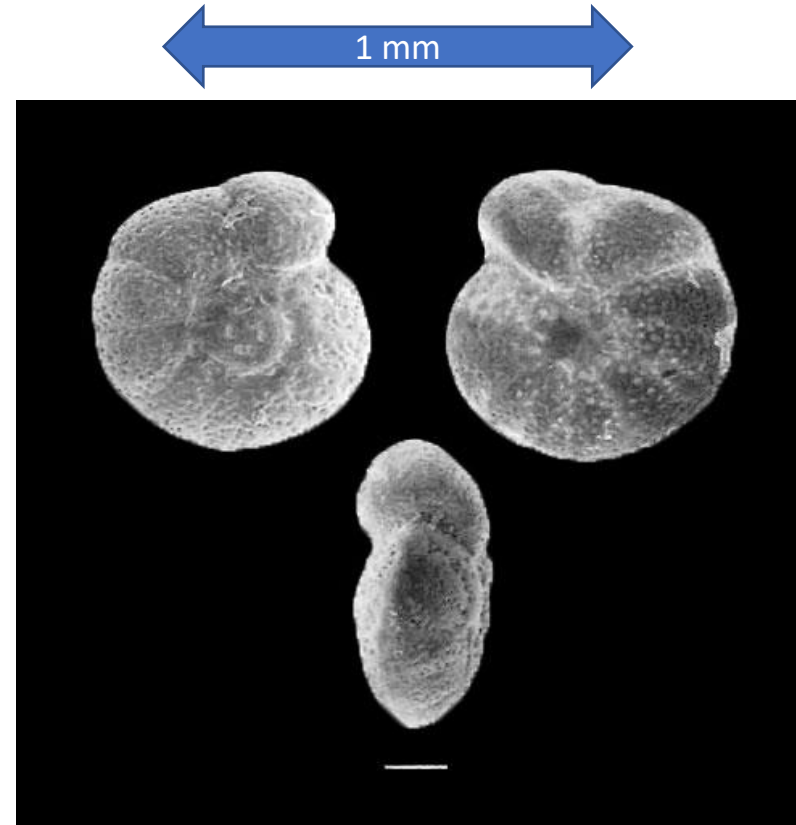
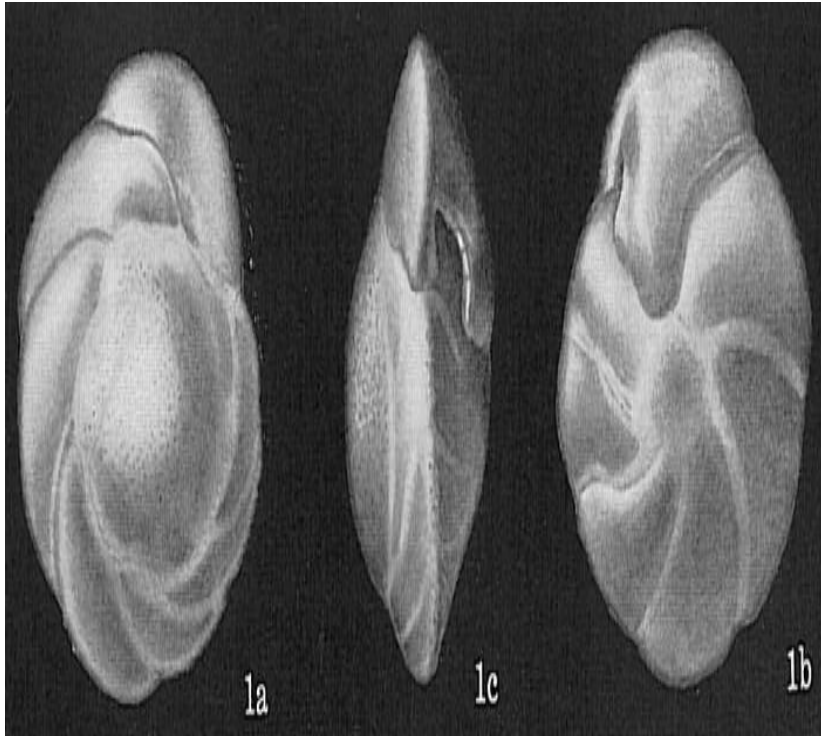
Continental Drift

New, extensive data set became available in September 2020.

High sample density and accuracy.

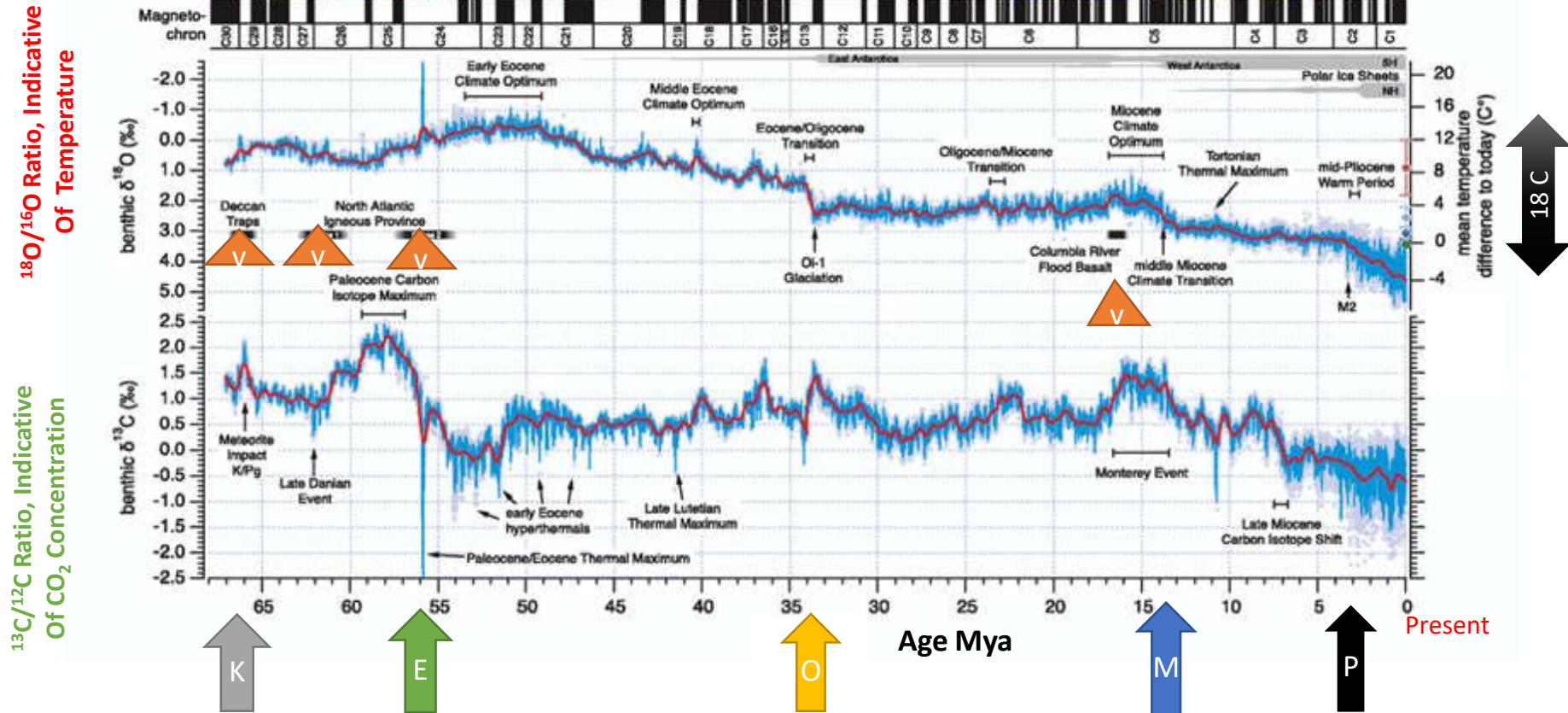
Very Long Time Series analysis of ^{18}O and ^{13}C in microscopic plankton.

Benthic Forams, Cibicidoides & Nuttallides



67 Million Year Record Of Temperature and CO₂ Concentration Using Isotopic Analysis Of Benthic Forams From Sea Sediment Cores

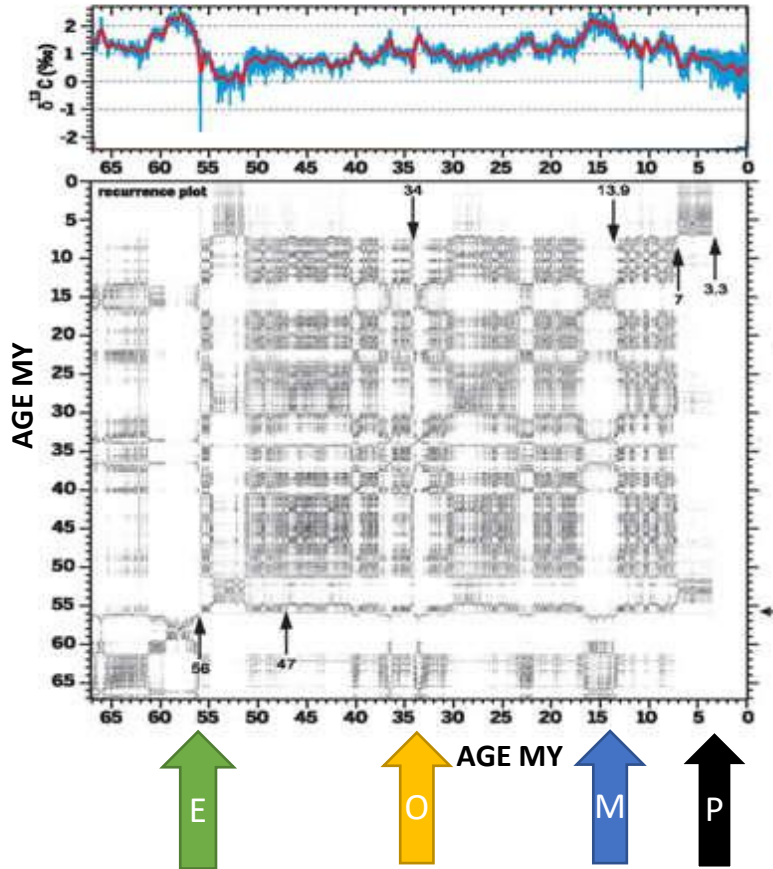
Westerhold - Science, Sept 11th 2020



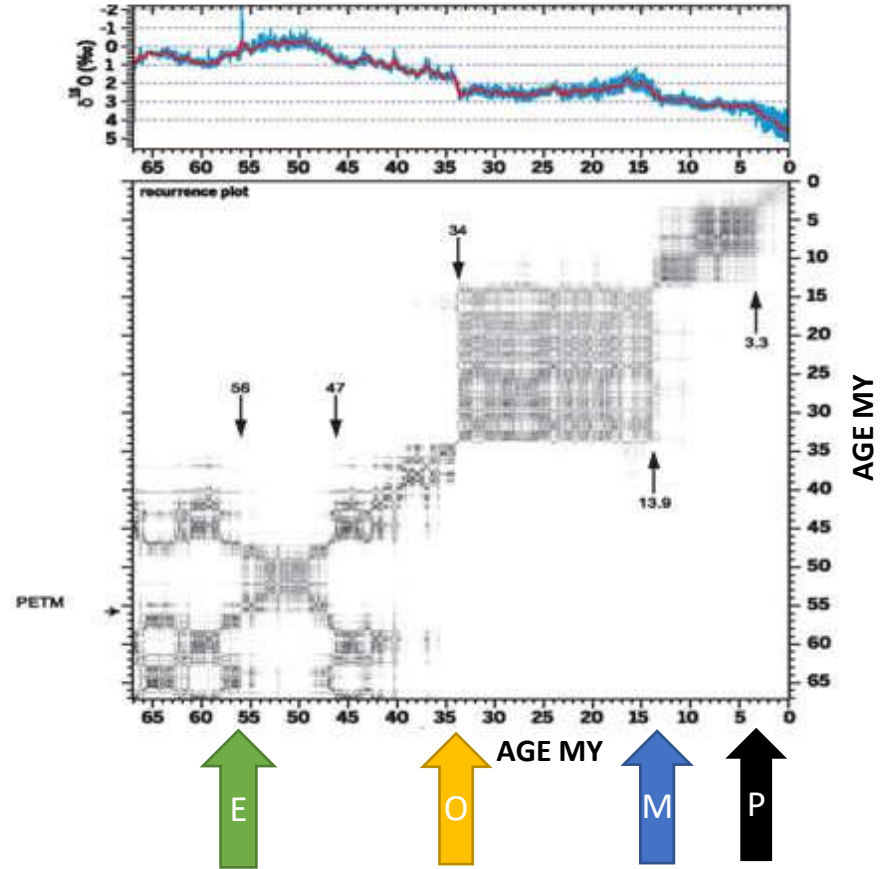
Recurrence Plots of $^{13}\text{C}/^{12}\text{C}$ and $^{18}\text{O}/^{16}\text{O}$ Benthic Forams

Westerhold - Science, Sept 11th 2020

$^{13}\text{C}/^{12}\text{C}$, indicative of CO_2 Concentration



$^{18}\text{O}/^{16}\text{O}$, indicative of Temperature

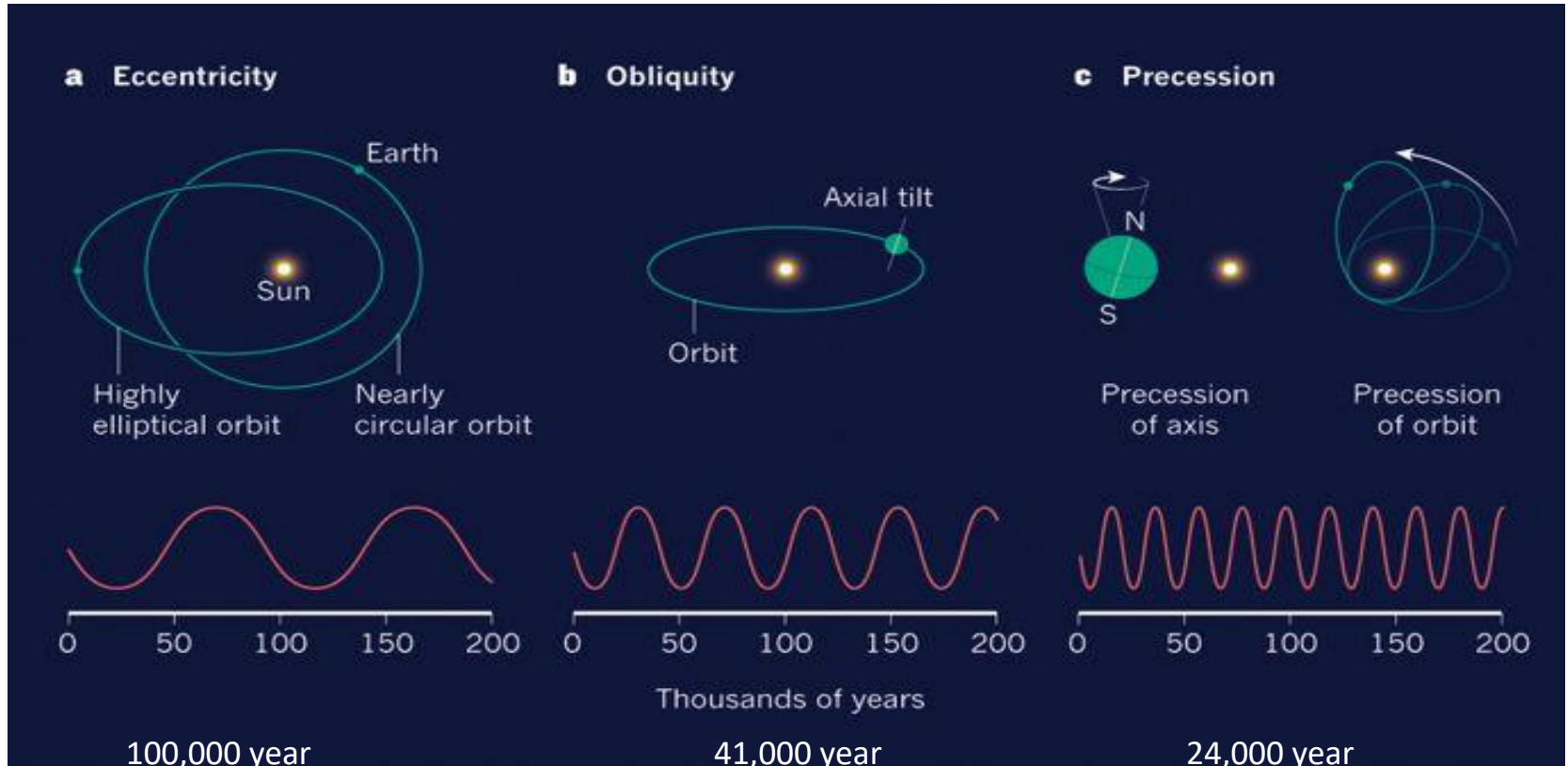


Incoming Solar Energy Is Affected by Cyclic Orbital Variations

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



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

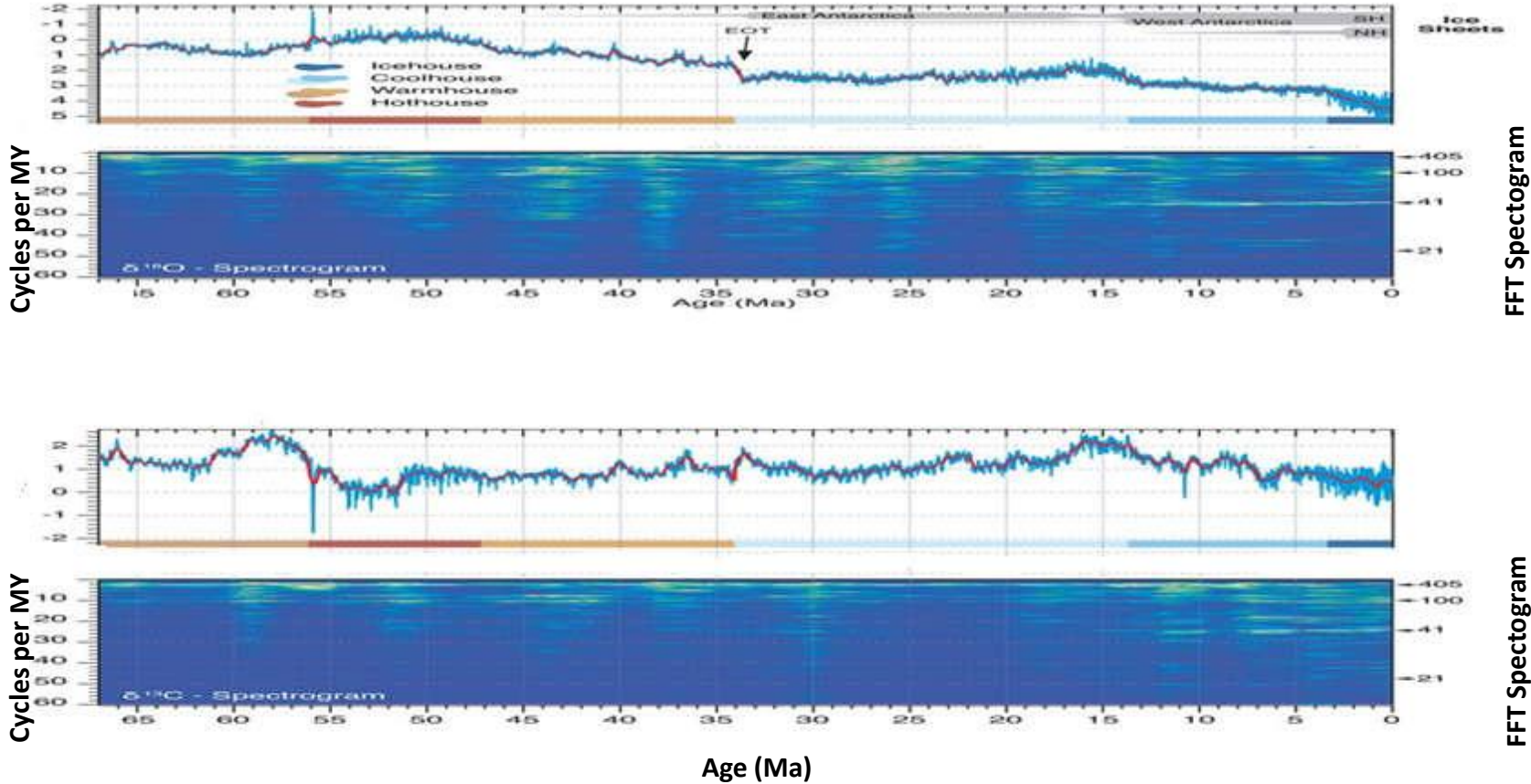


FFT Analysis of $^{13}\text{C}/^{12}\text{C}$ and $^{18}\text{O}/^{16}\text{O}$ Benthic Forams

Westerhold - Science, Sept 11th 2020

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

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

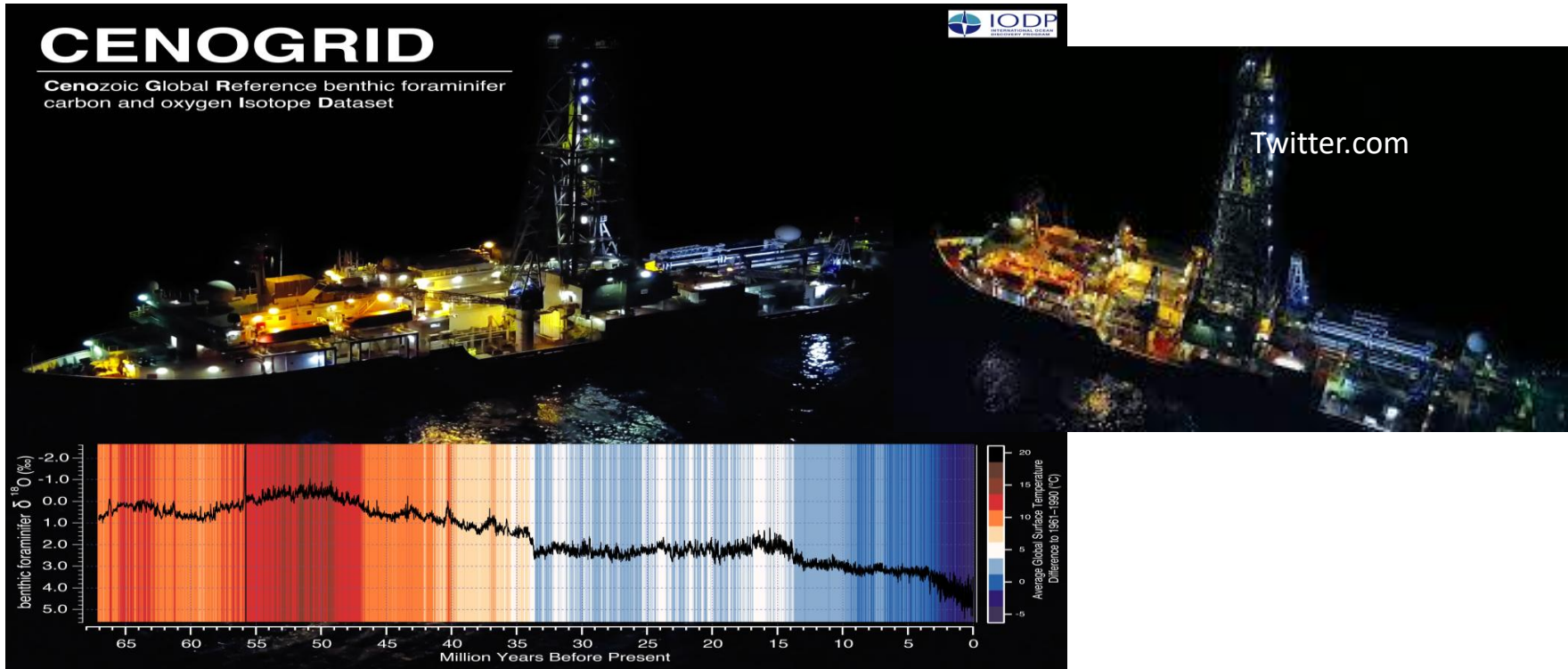


FFT Spectrogram

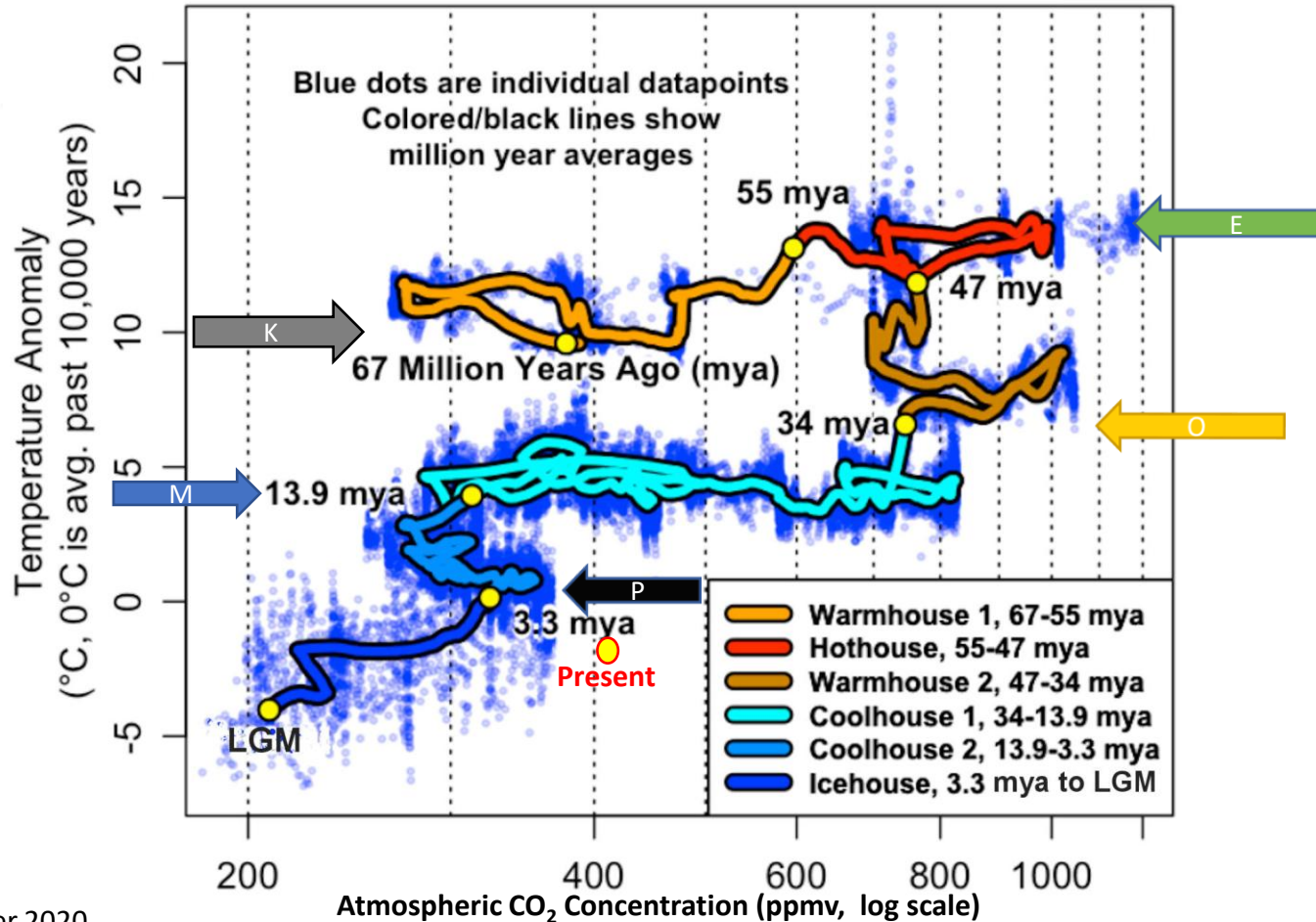
FFT Spectrogram

67 Million Years Of CENOGRID Temperature vs Atmospheric CO₂ Concentration

Willis Eschenbach re-plotting of the CENOGRID data



67 Million Years Of CENOGRID Temperature vs Log Of Atmospheric CO₂ Concentration



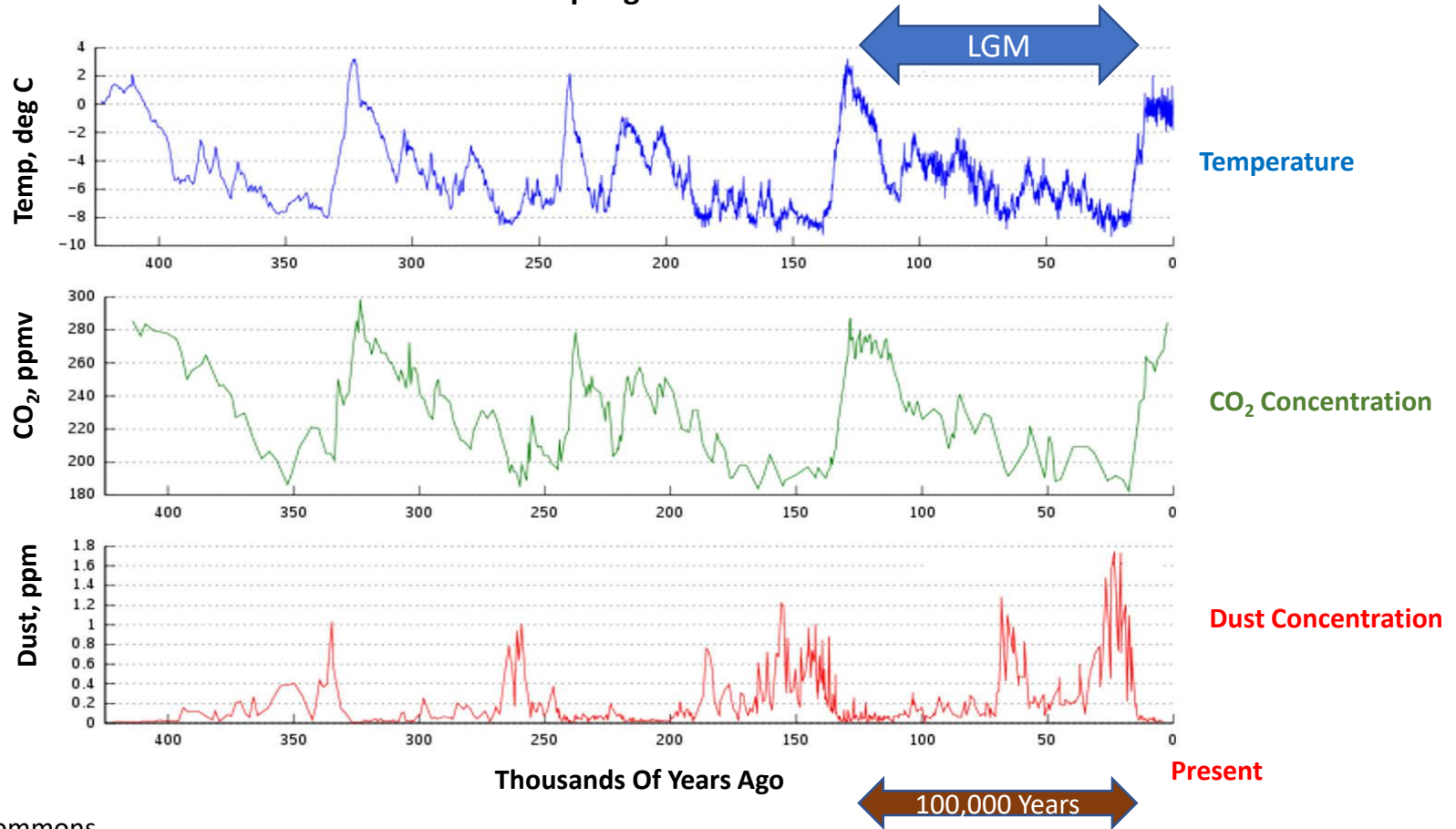
LATEST GLACIAL MAXIMUM (LGM)

120,000 Years ago to 20,000 Years ago

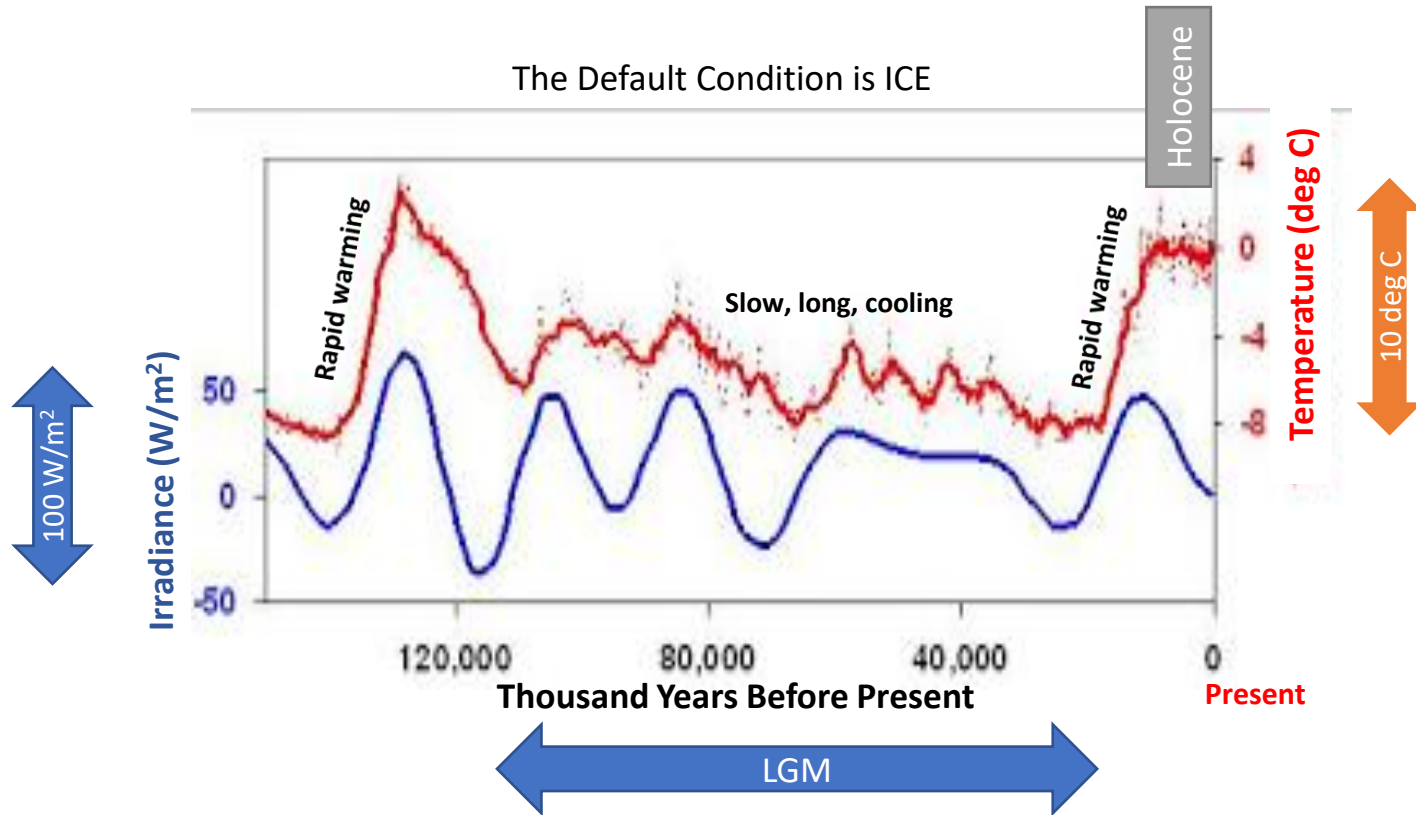


Antarctic Dust Inversely Proportional To Temperature During Glacial Cycles

Sampling the Vostok Cores



Recovering From The Latest Significant Glaciation “LGM” Cycles of Irradiance (rate of “insolation”)



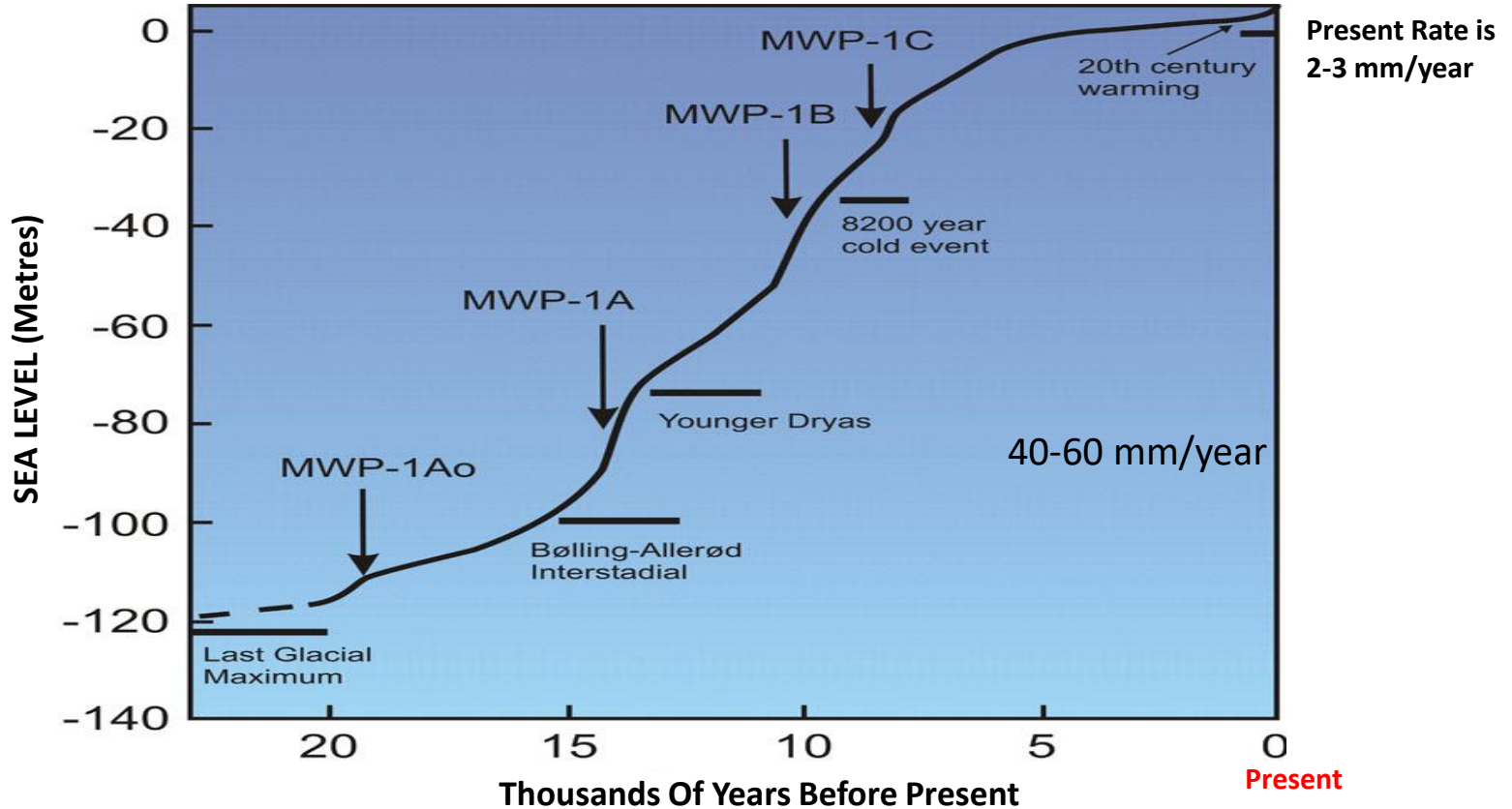
Termination DURATION From Glacial to Interglacial

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

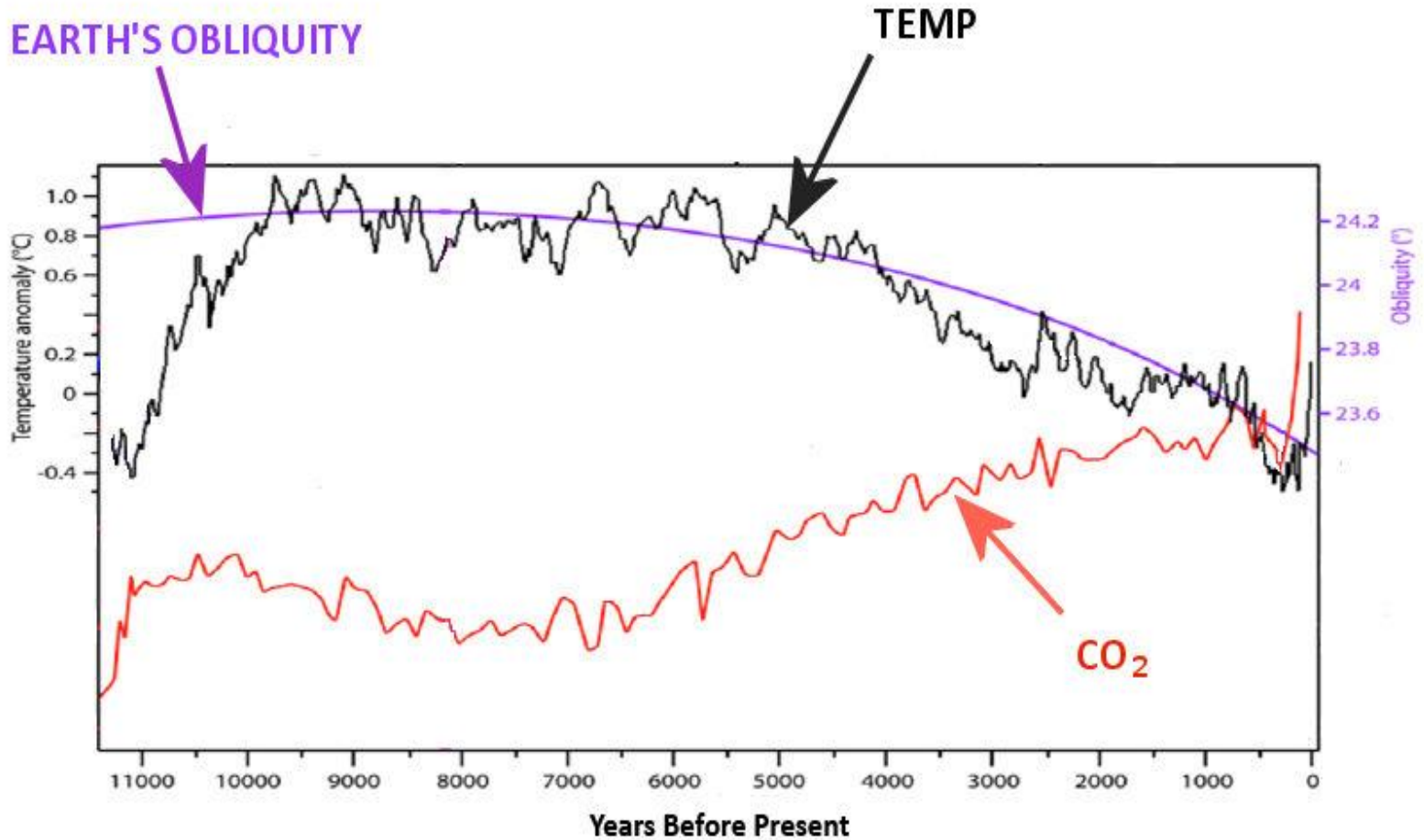
120 Metres Change



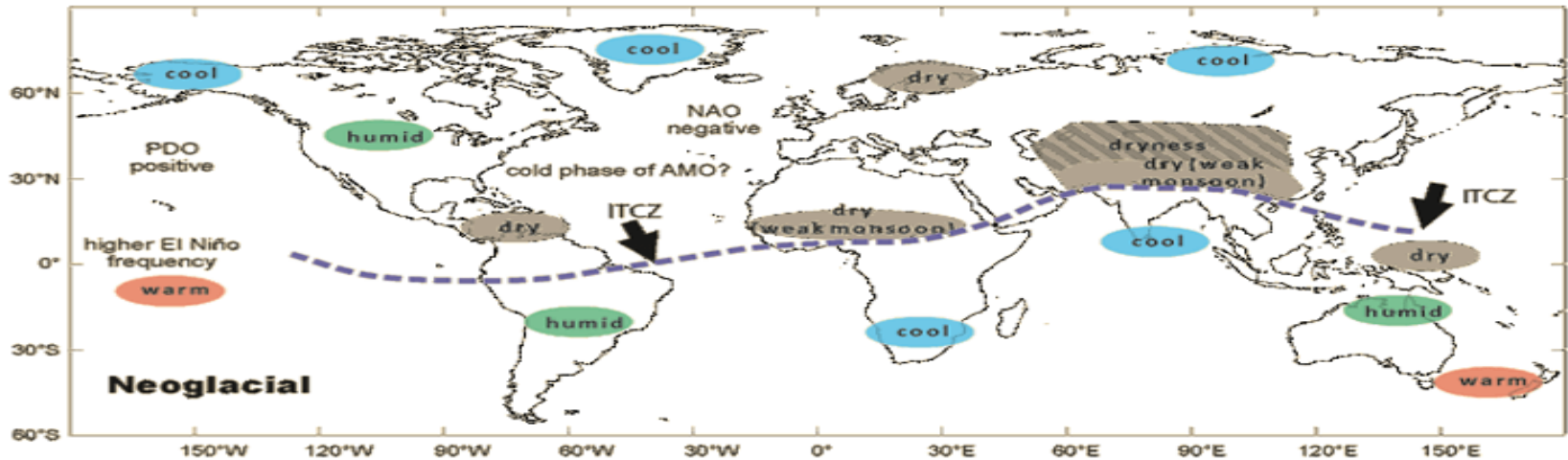
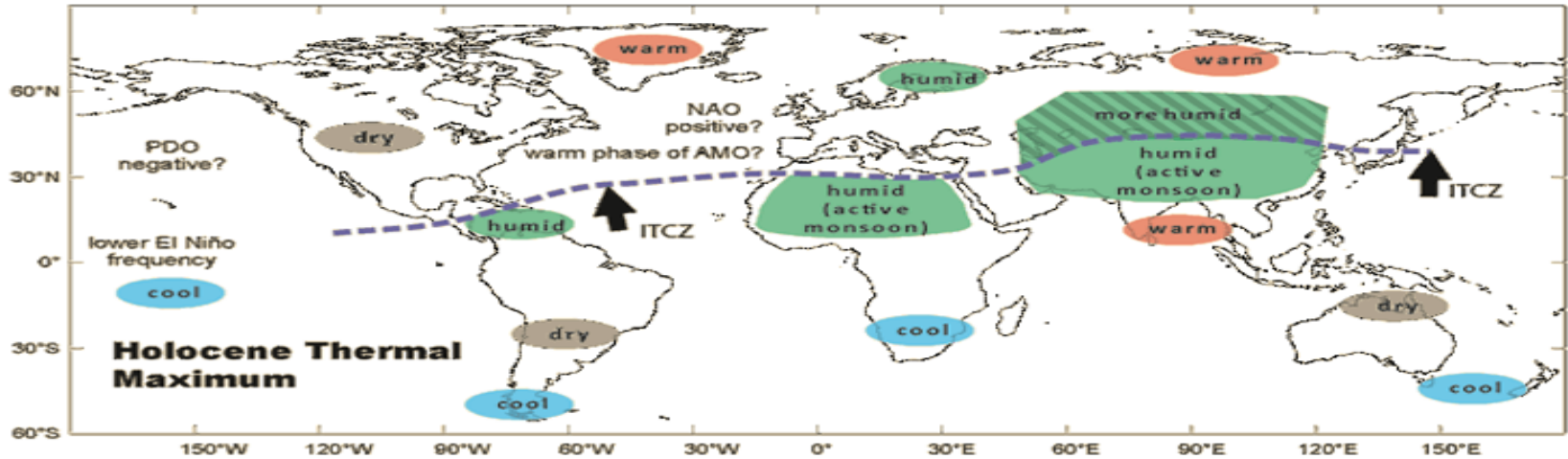
Changes During The Holocene – The Last 11,000 Years



The Holocene Record



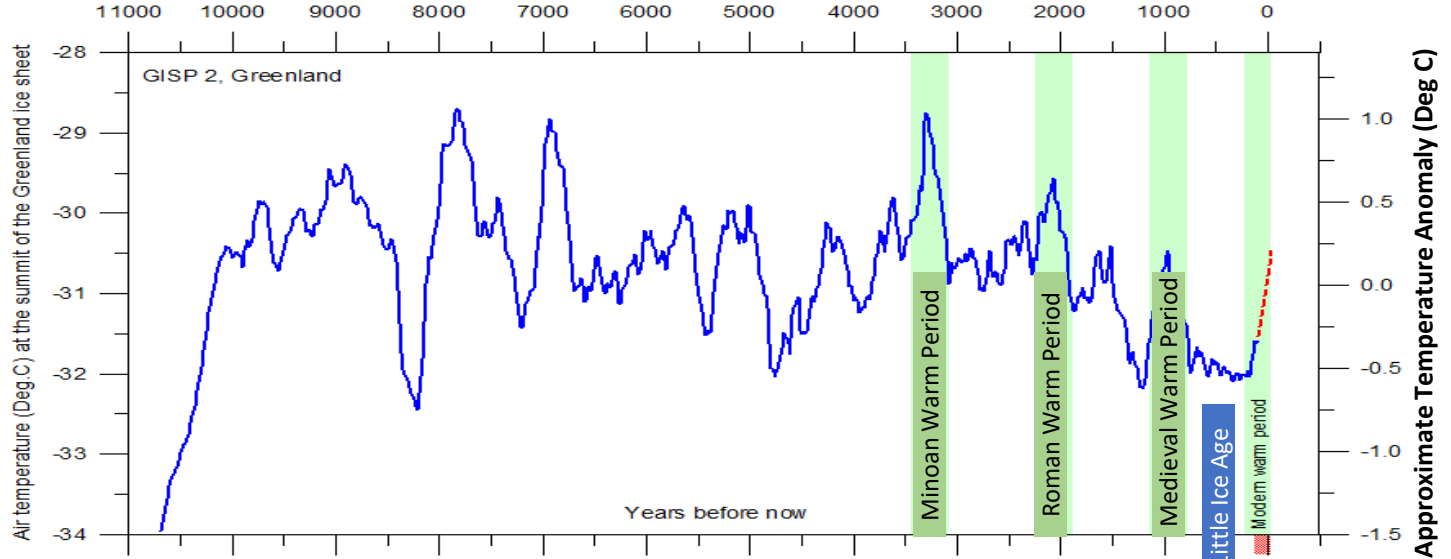
Holocene: Thermal Maximum vs. Neoglacial



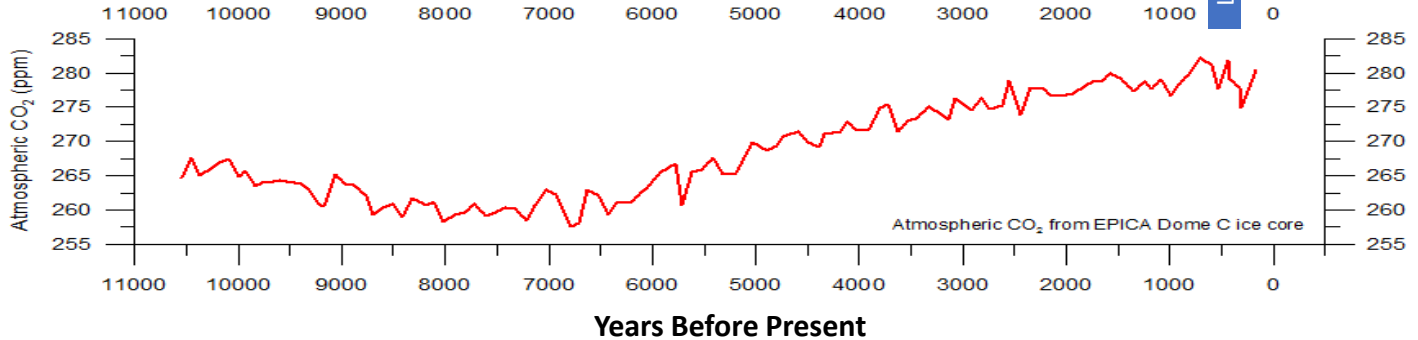
HOLOCENE Warm And Cool Periods



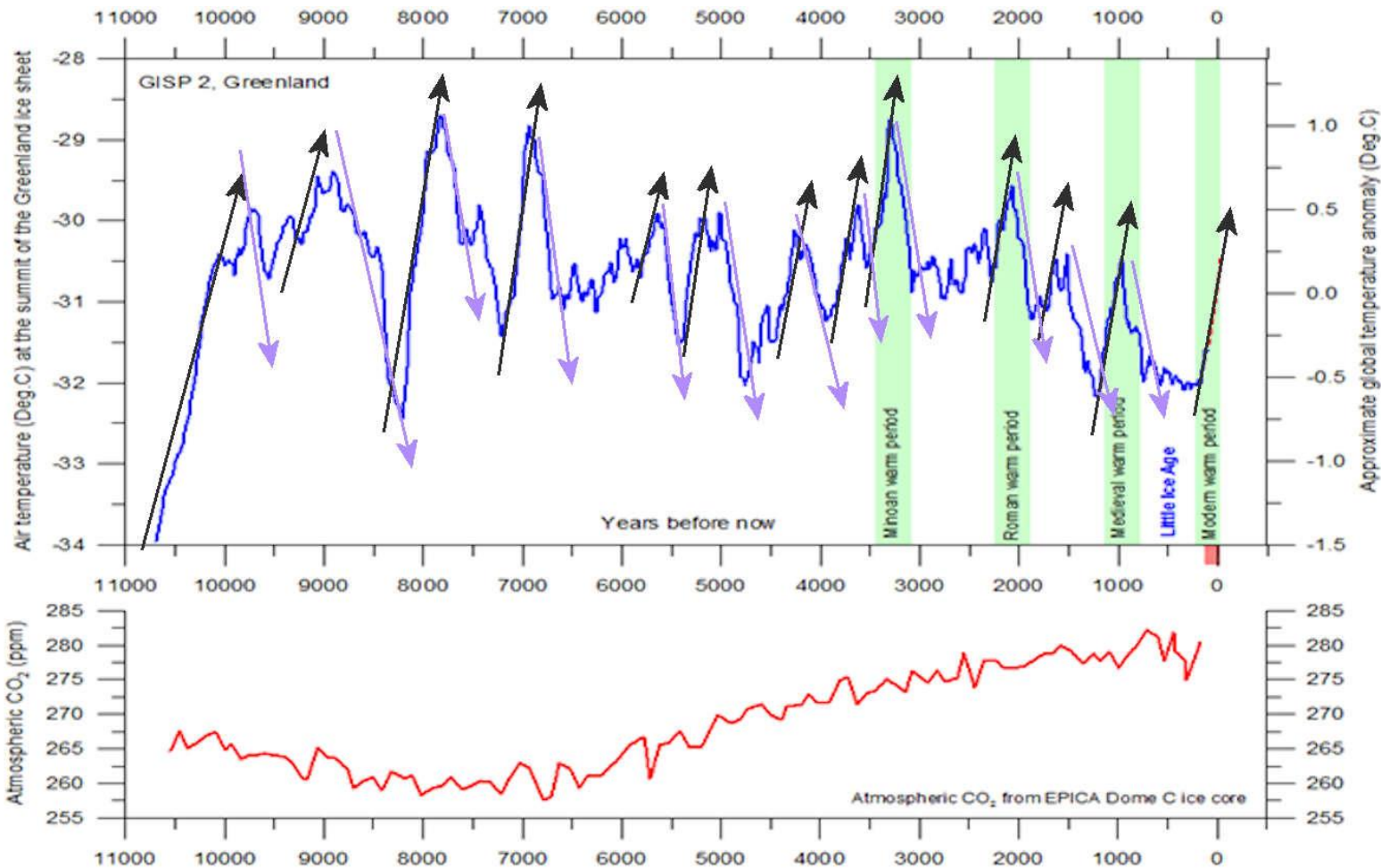
Temperature



CO₂ Concentration



Rates of Holocene Temperature Change



Rate Of Change Of Temperature (Degrees C/Year)

0.0090

HOLOCENE Temperature Change Rates

0.0080

0.0070

0.0060

0.0050

0.0040

0.0030

0.0020

0.0010

0.0000

0.0077

0.0067

0.0050

Early Holocene
Optimum
Rates of Change

Minoan

0.0042

Roman 2

0.0049

Roman

Medieval

Modern

Neoglacial Rates
Of Change

Current

1

2

3

4

5

6

7

8

9

10

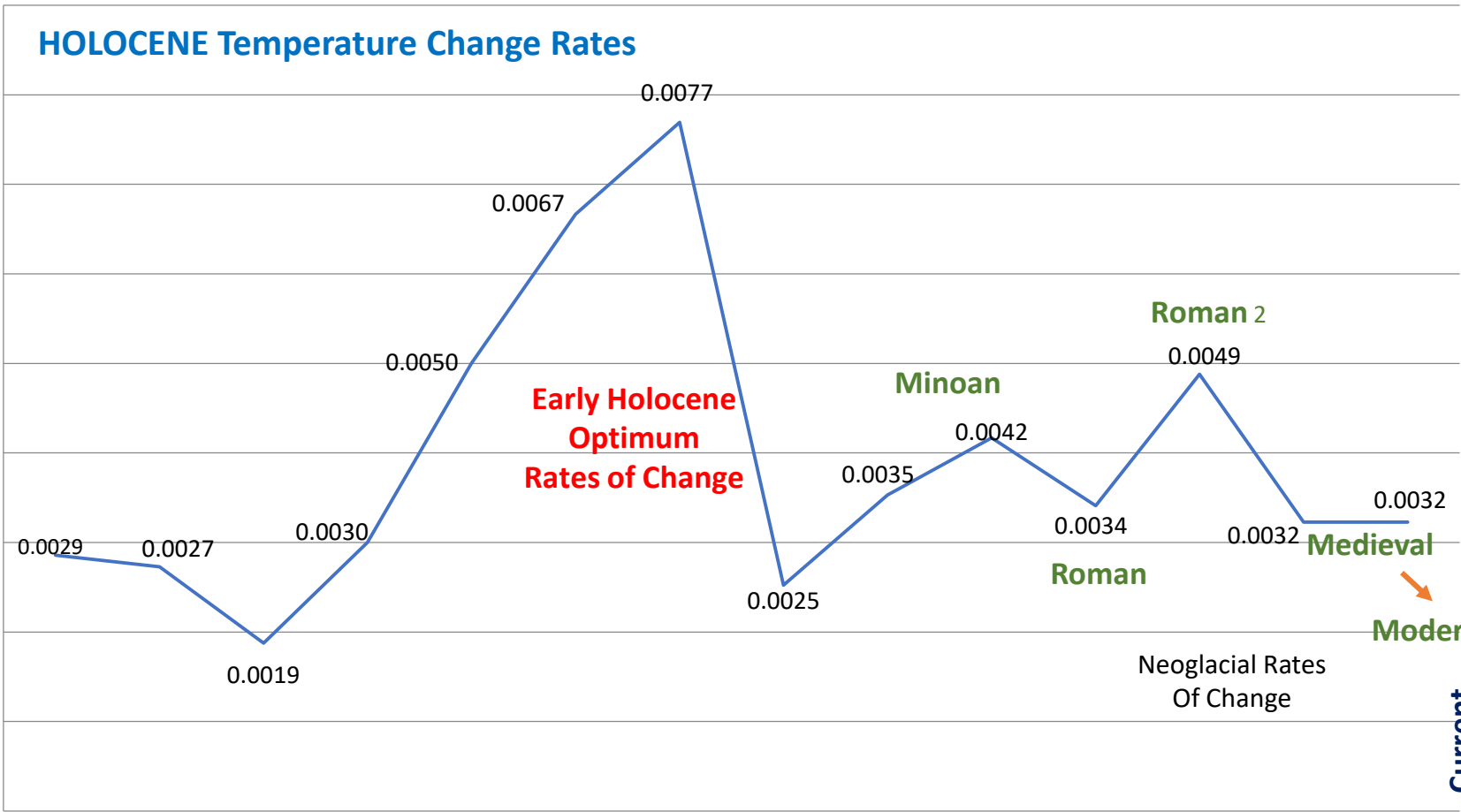
11

12

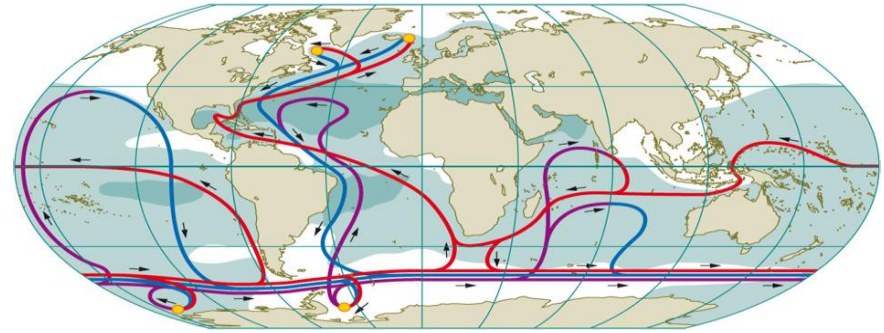
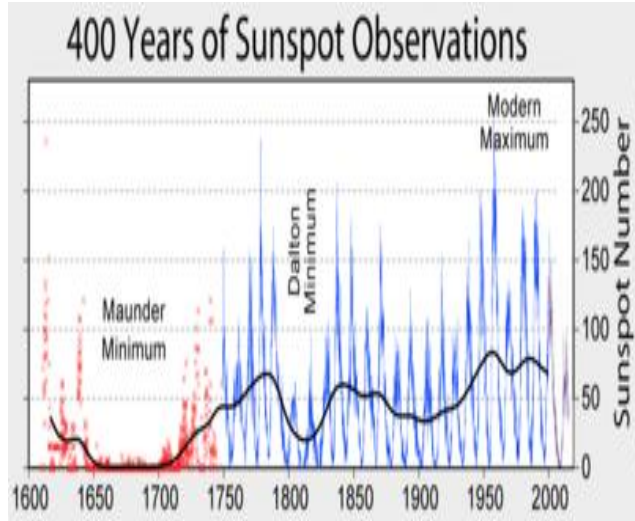
13

14

WARMING CYCLE

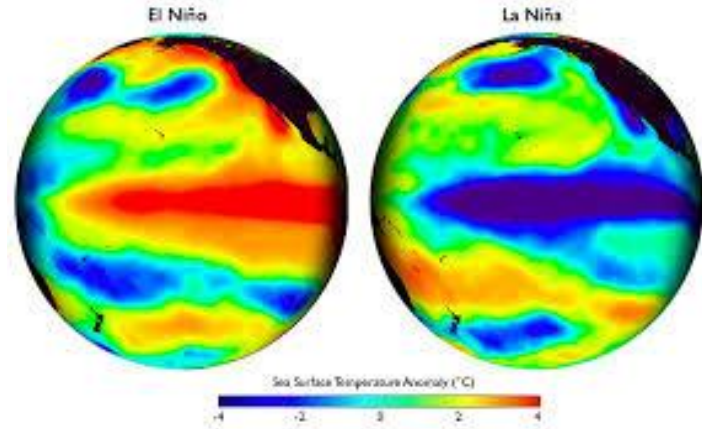
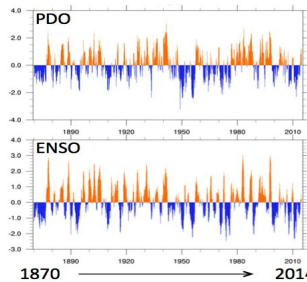
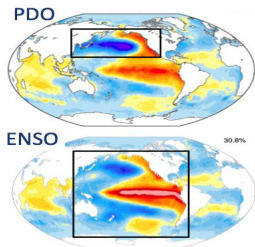


Modern Period (the last few hundred years)



World Ocean review

Wikipedia



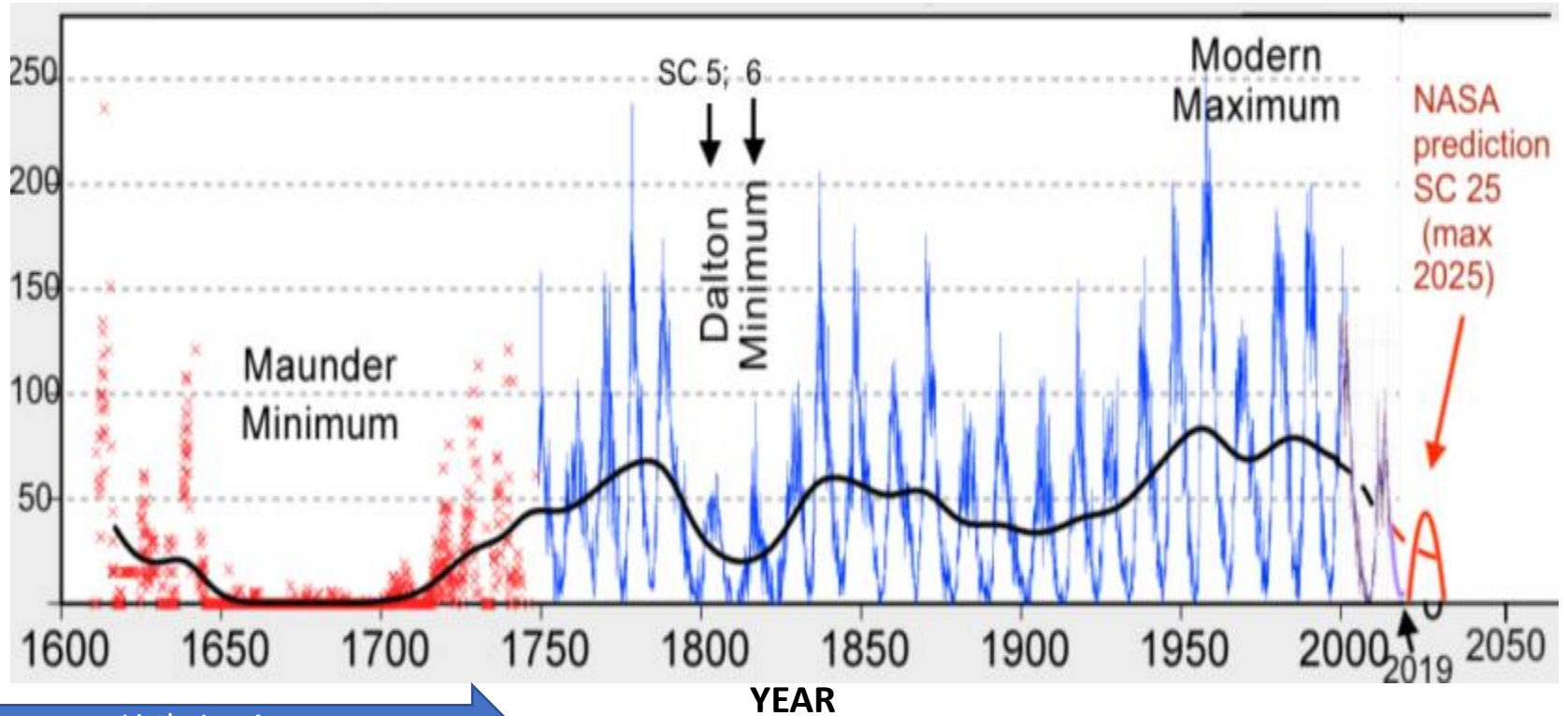
Climate.gov

Modern Period (the last few hundred years)

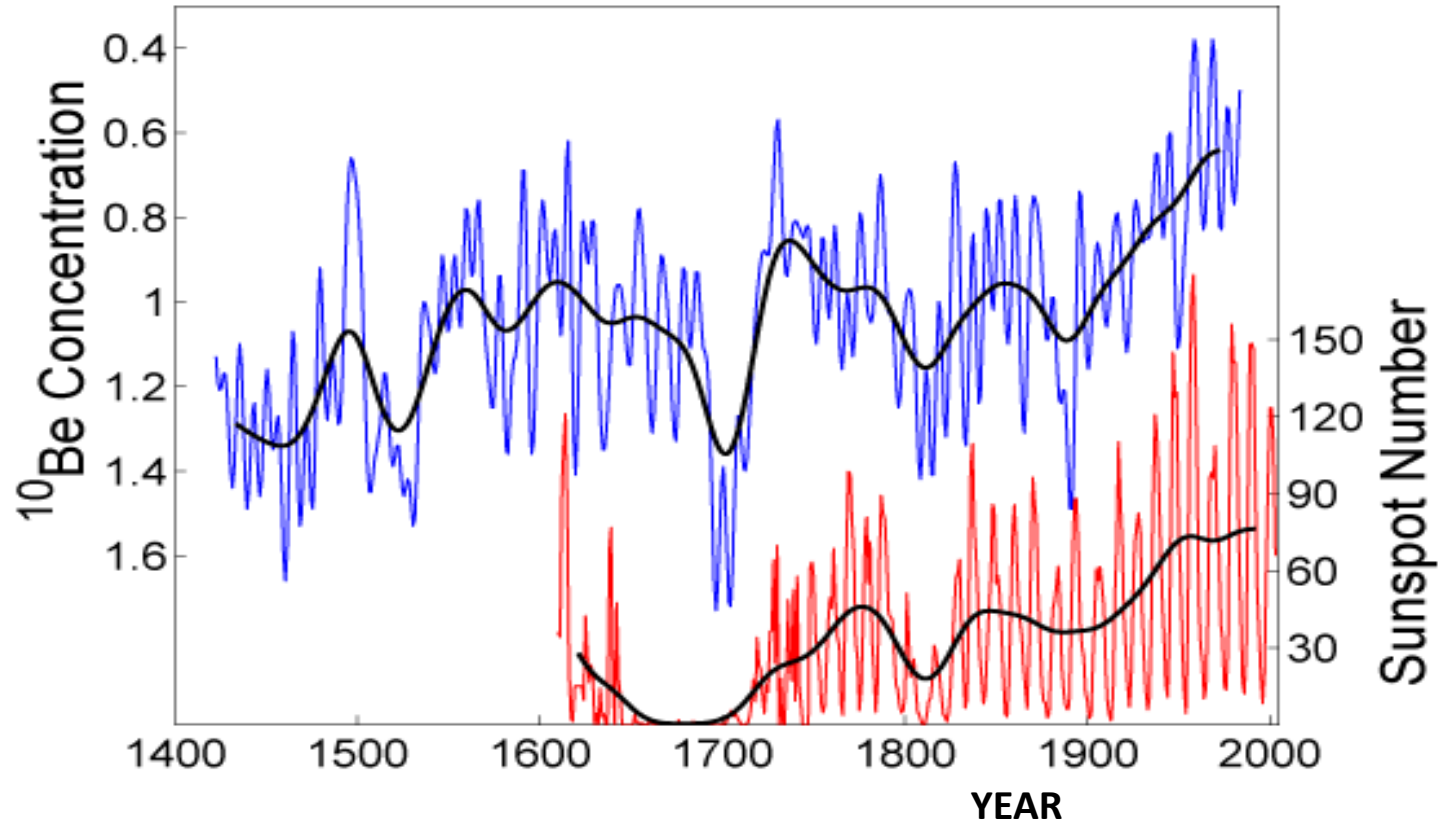
Climate and Weather are driven by:

- **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



Upper Atmospheric ^{10}Be Correlates With Sunspot Activity

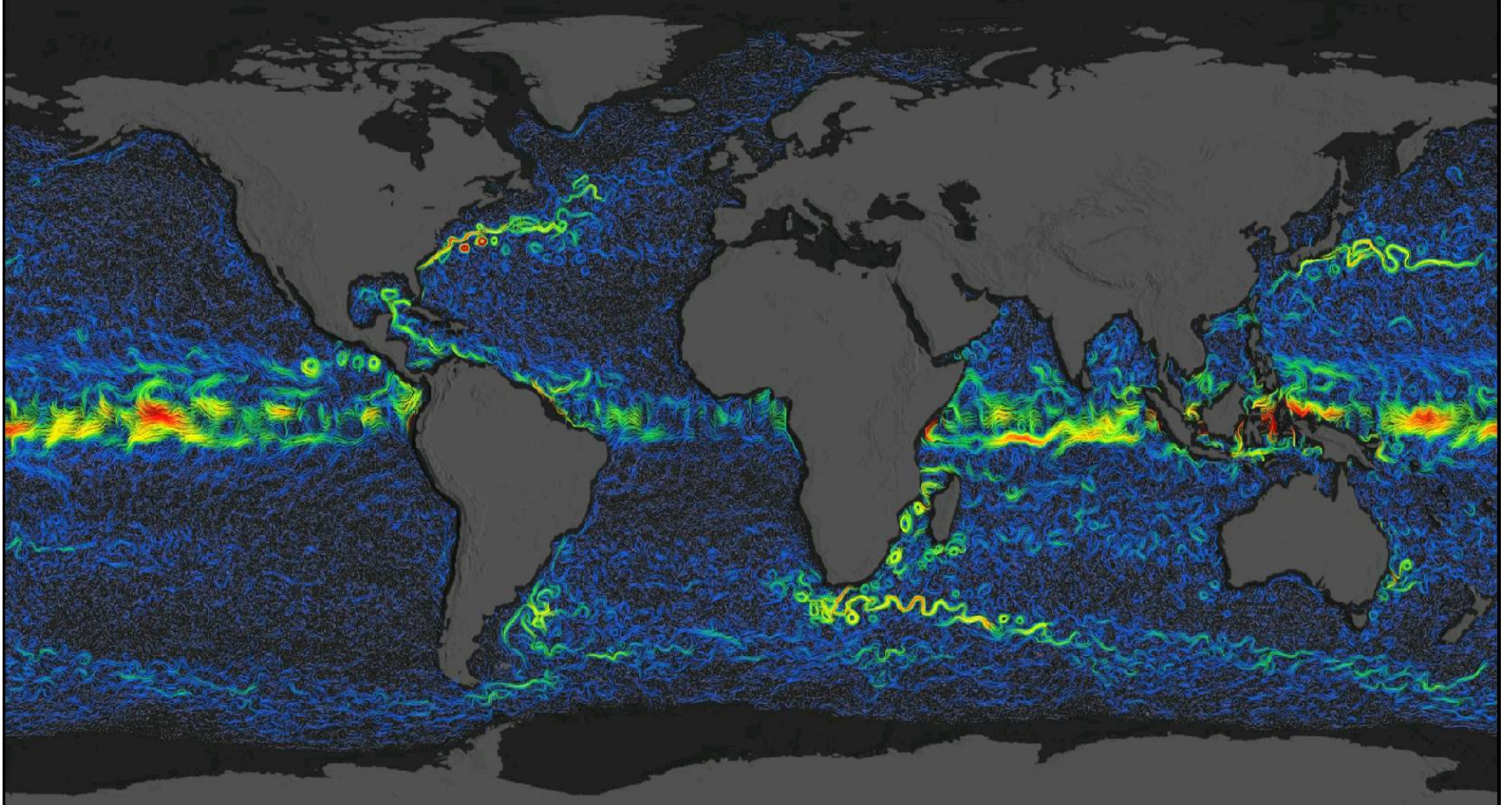


← Little Ice Age →

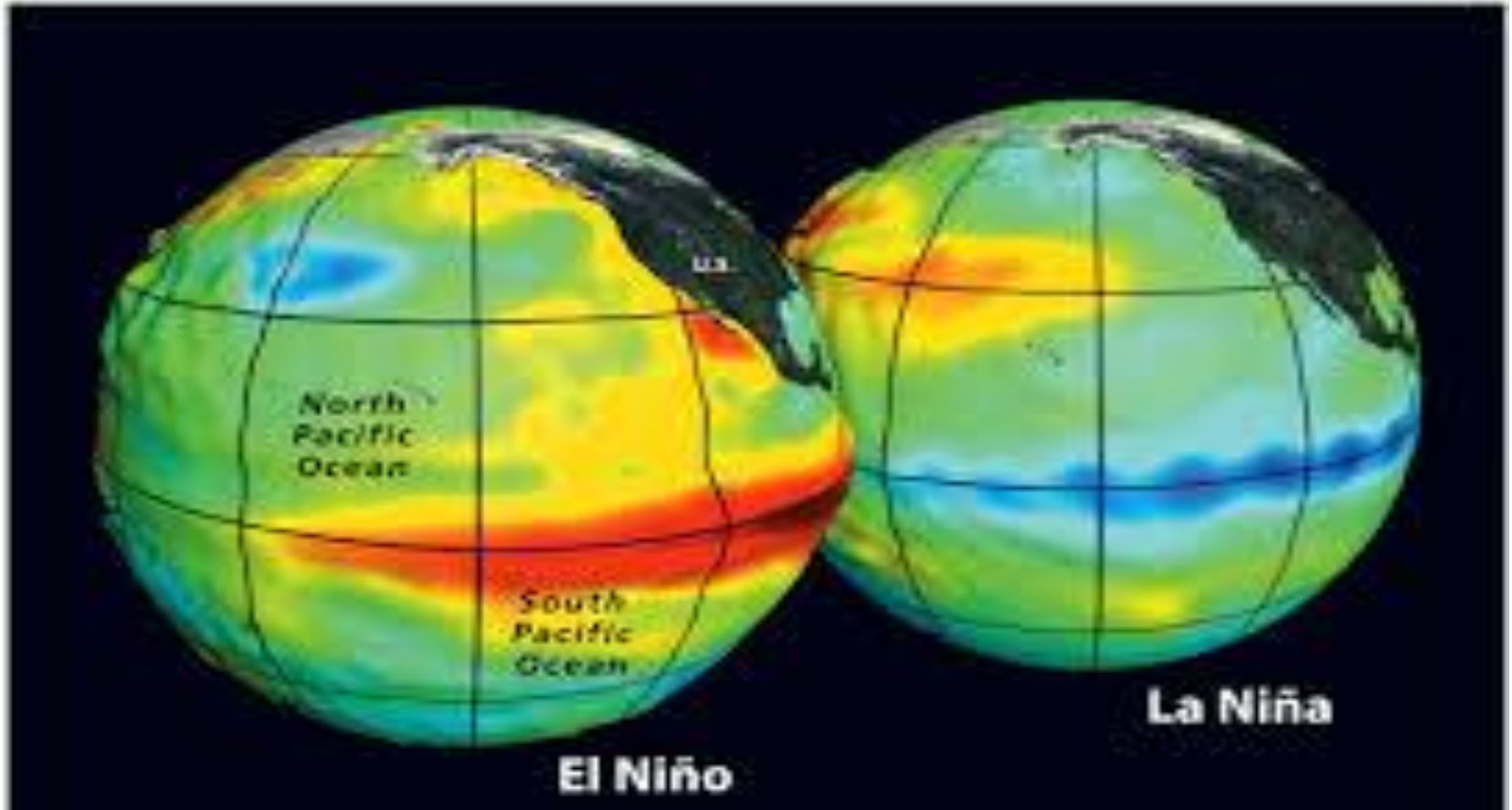
Today's Ocean Currents and Climate

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

Modern Earth's Ocean Currents

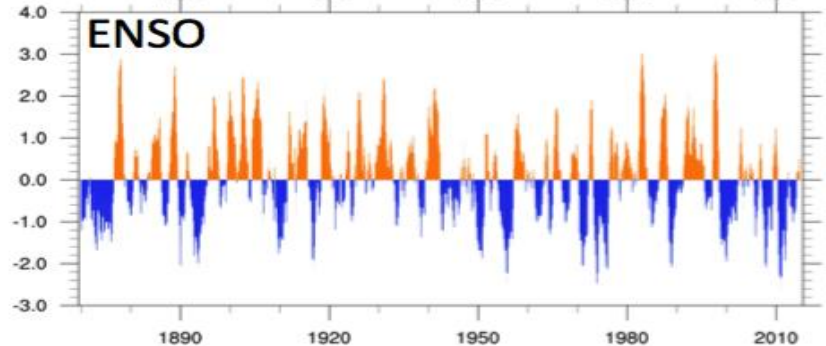
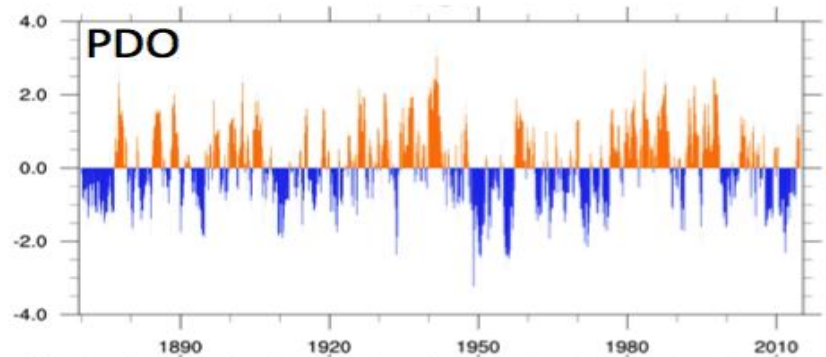
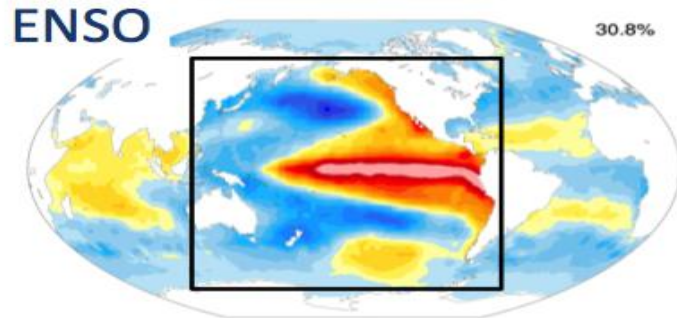
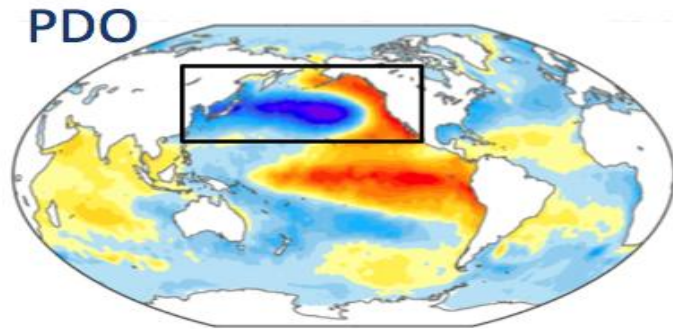


El Nino Vs La Nina Pacific: ENSO Temp



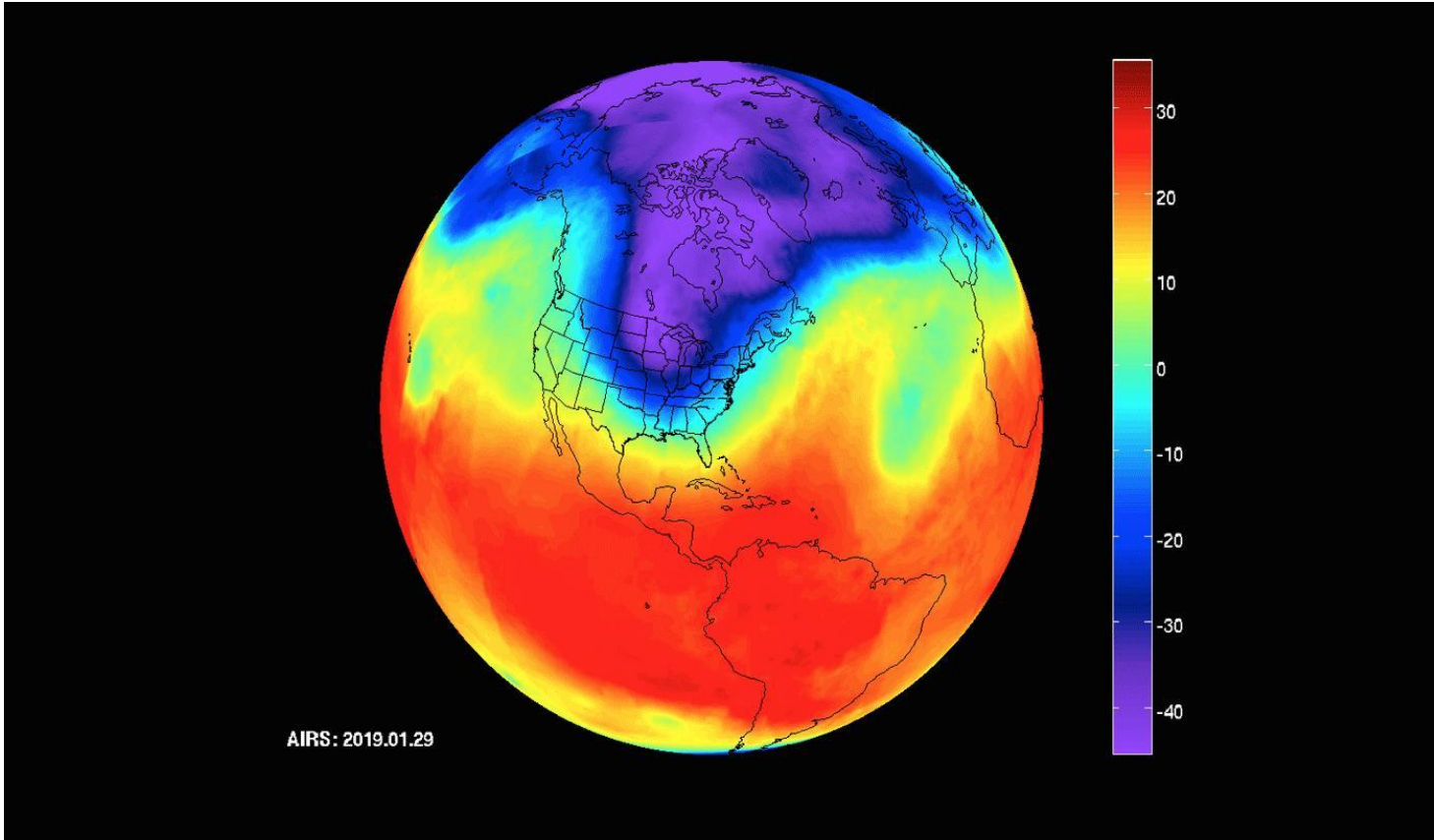
Pacific Decadal Oscillation **PDO**

El Nino Southern Oscillation **ENSO**



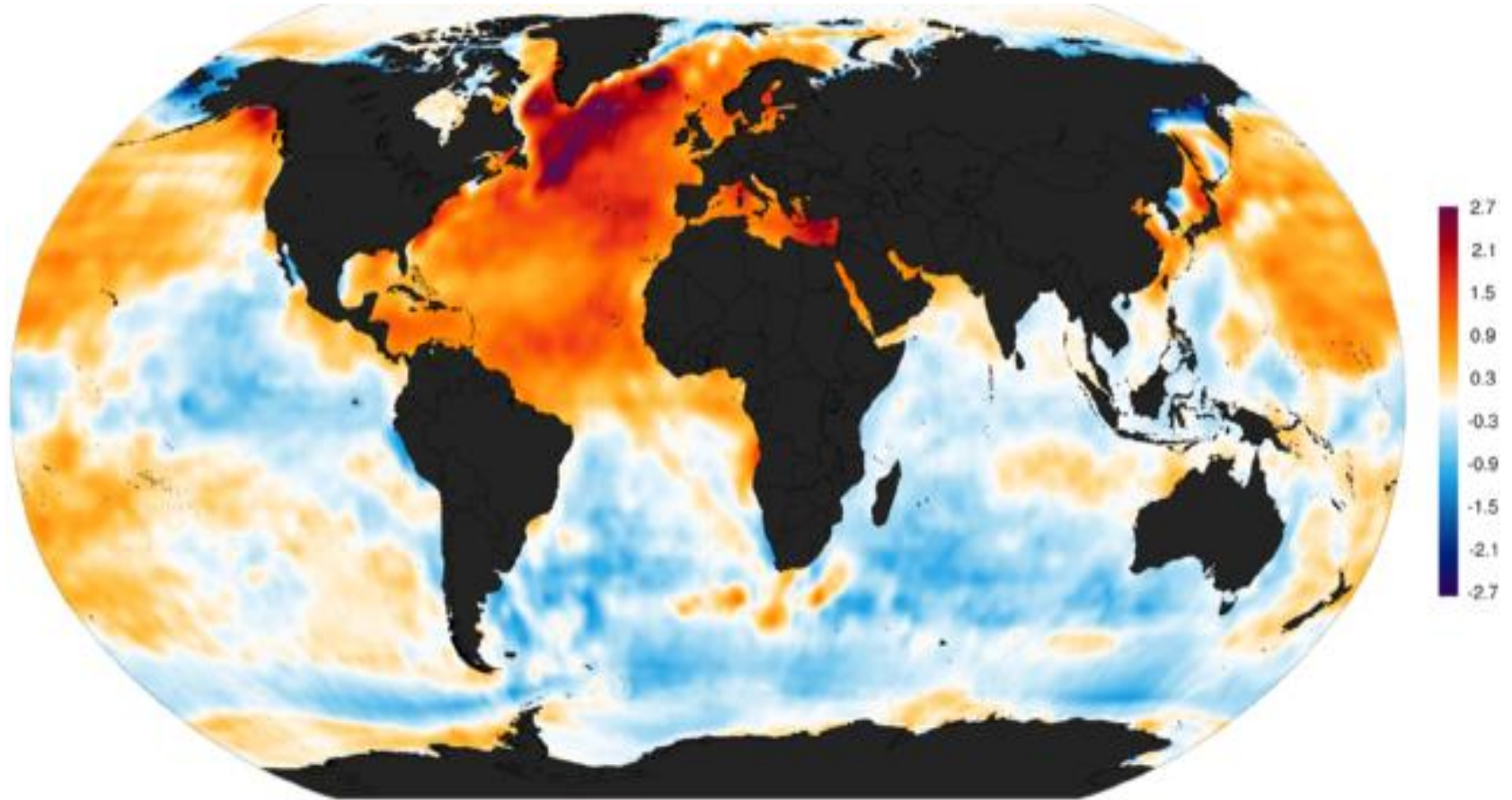
1870 → 2014

Infrared Image Of Northern Polar Vortex Hole



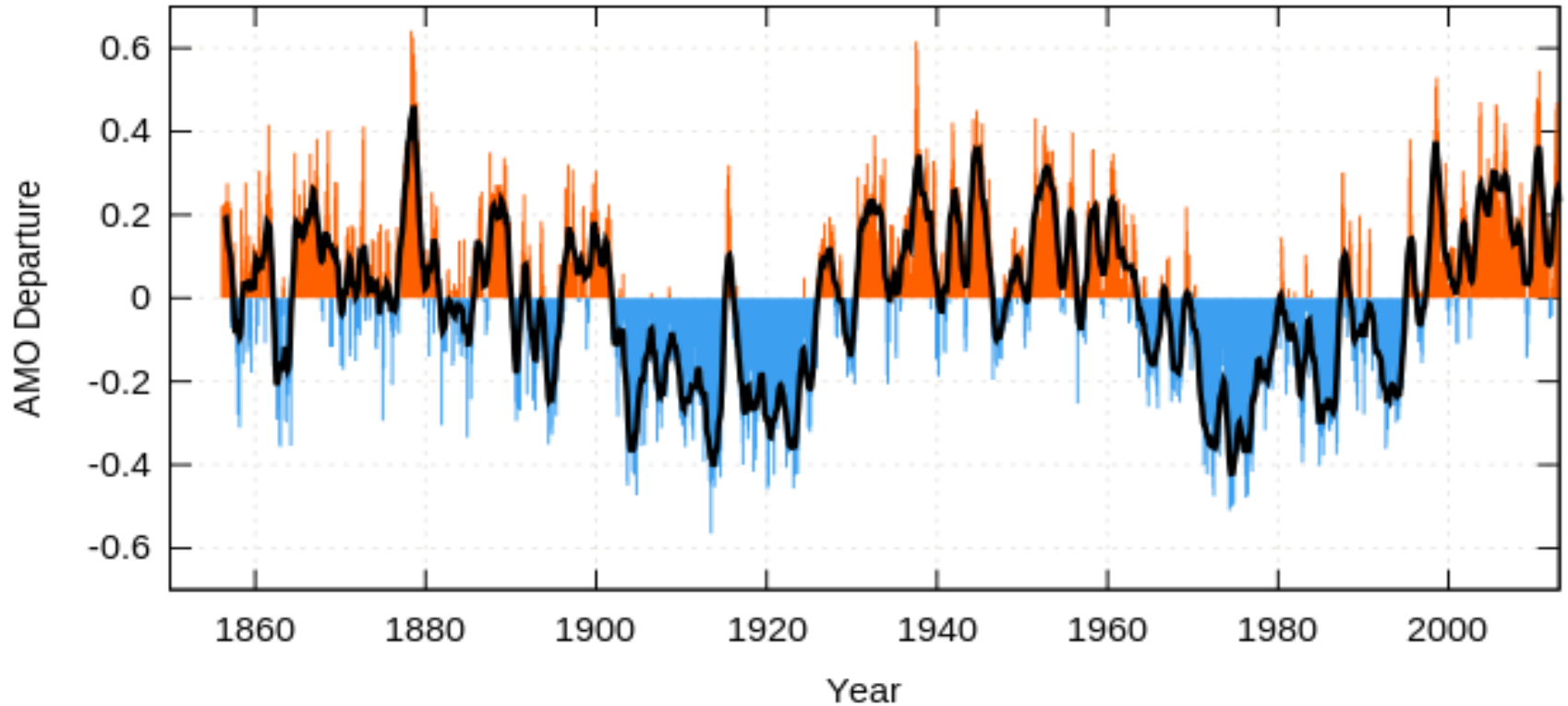
Jan 29, 2019

Atlantic Multidecadal Oscillation (AMO)

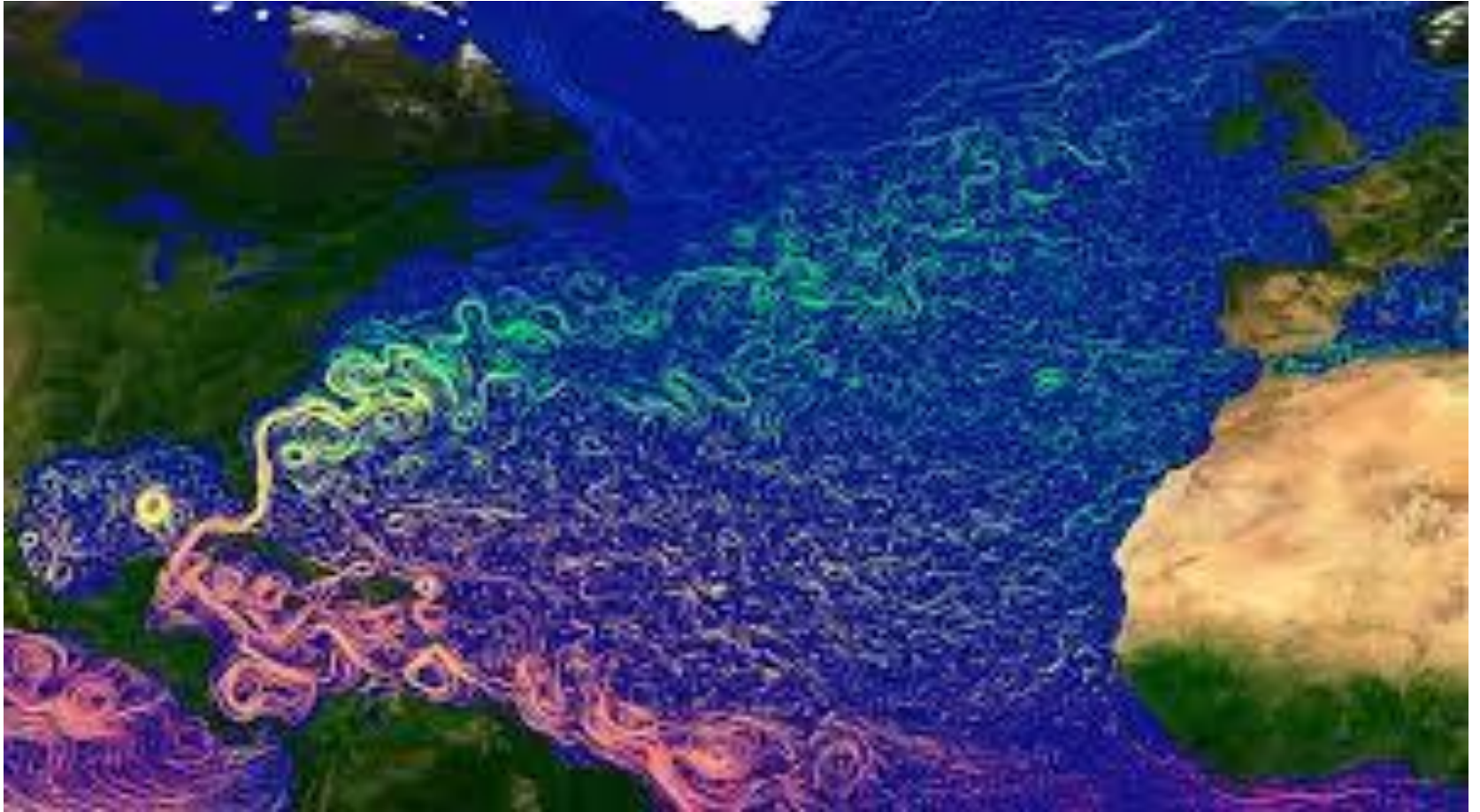


Atlantic Multidecadal Oscillation (AMO)

Monthly values for the AMO index, 1856 -2013



The Gulf Stream and South American Current



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, “CO₂ 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/YMHKt9yIPpQ>