Climate change throughout Earth history warms suddenly and cools slowly in erratic sequences that are not cyclic

Peter L. Ward
United States Geological Survey
retired

peward@Wyoming.com

The New Dawn of Truth
11 September 2016

The footprints of climate change within the geologic record show clearly that

Climate change throughout Earth history

warms suddenly and cools slowly

in erratic sequences that are not cyclic

The footprints of climate change within the geologic record show clearly that

Climate change throughout Earth history

warms suddenly and cools slowly

in erratic sequences that are not cyclic

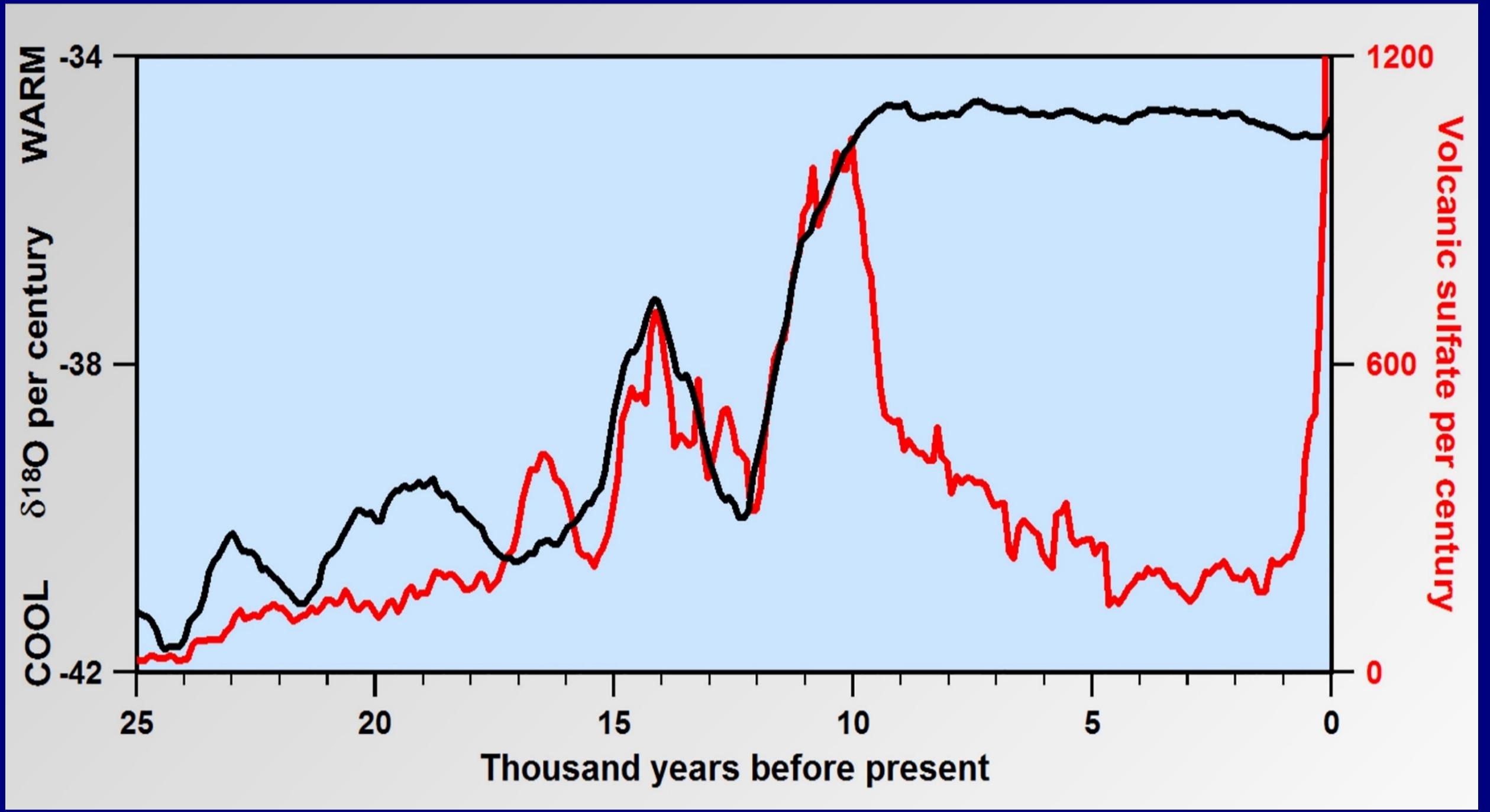
A valid theory of climate change

must explain these erratic sequences

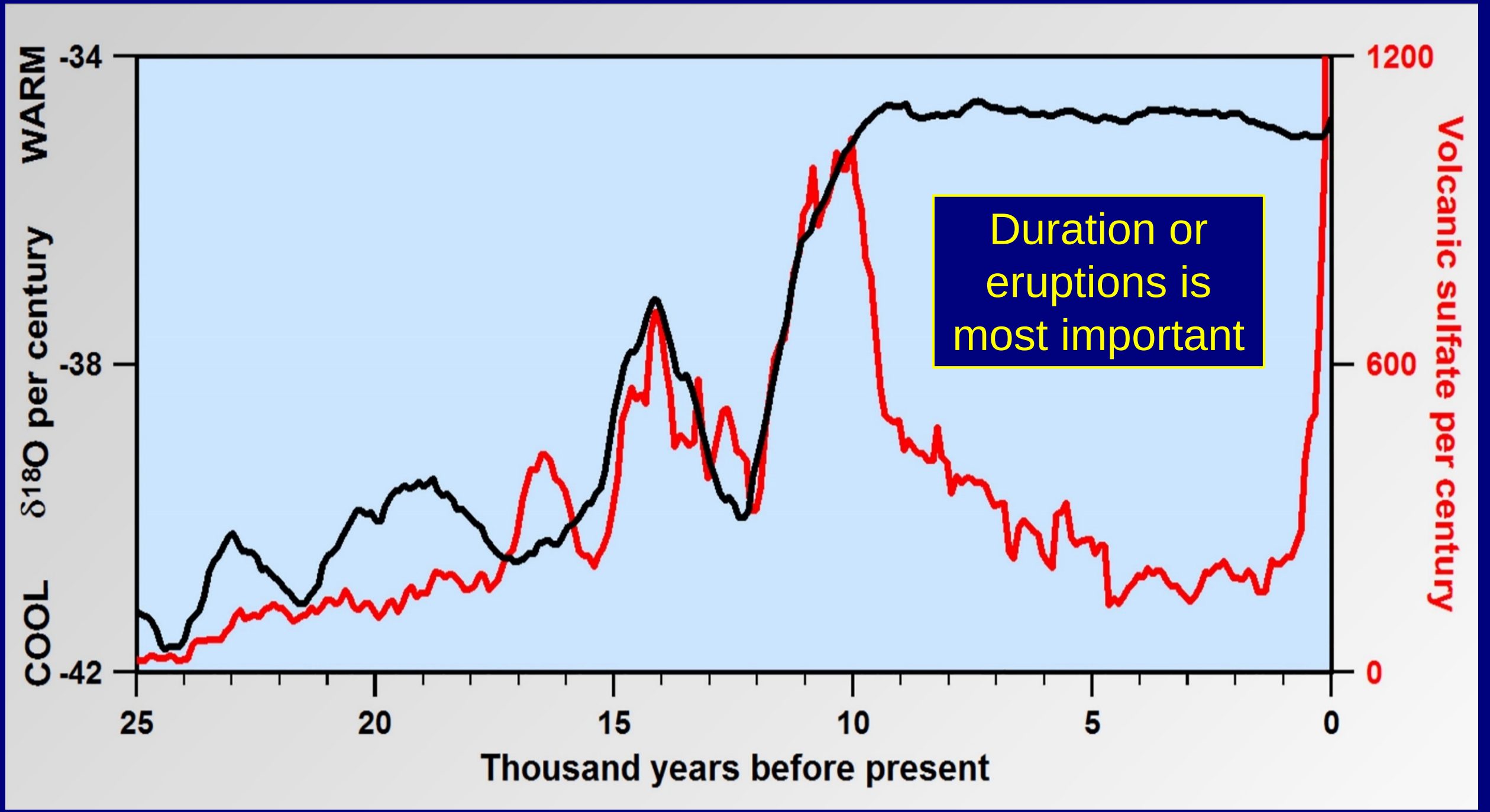
Greenland Ice Sheet Program Drill Hole 2 (GISP2)

1988 to 1993

Mayewski et al., 1995



Zielinski et al., 1996



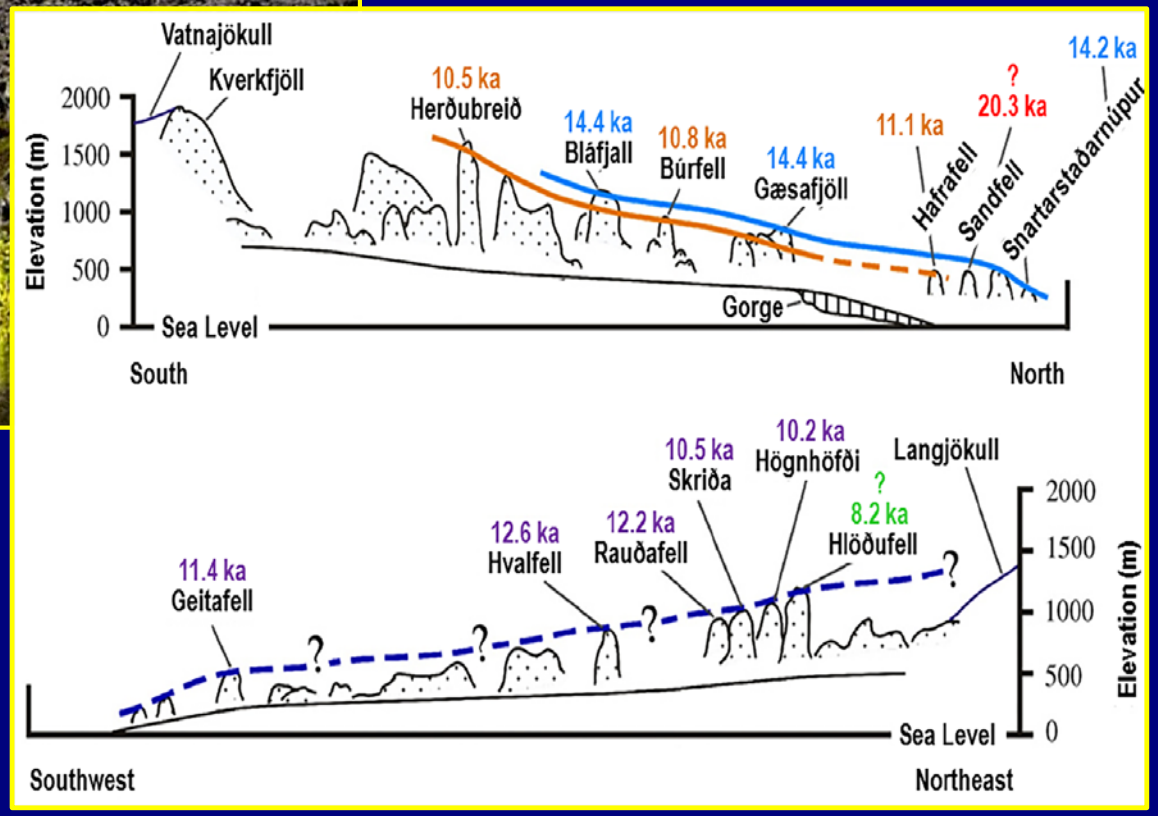
Zielinski et al., 1996

Evidence of sub-glacial volcanism in Iceland

Herðubreið, a tuya in north-east Iceland

Evidence of sub-glacial volcanism in Iceland

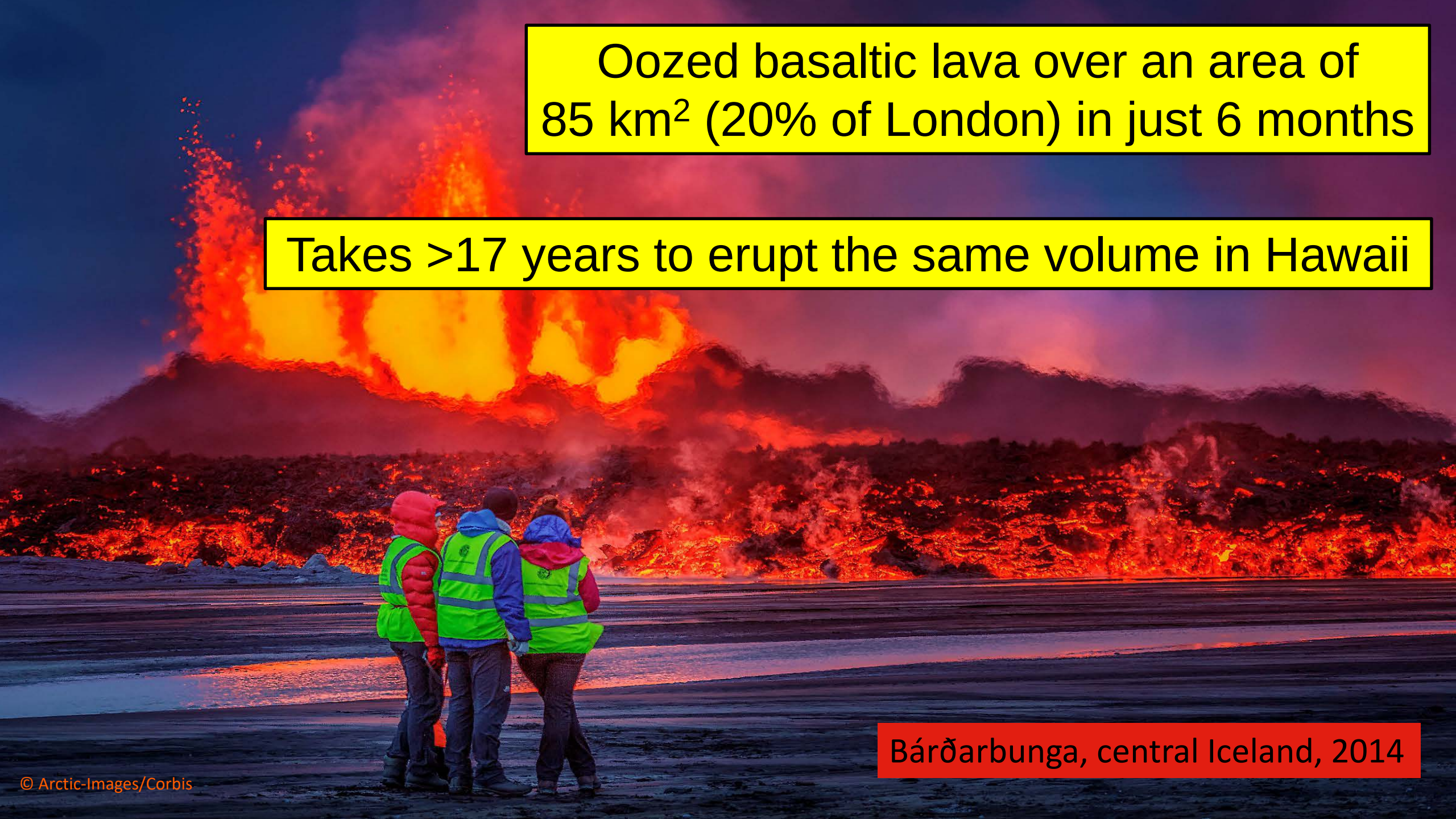
Herðubreið, a tuya in north-east Iceland

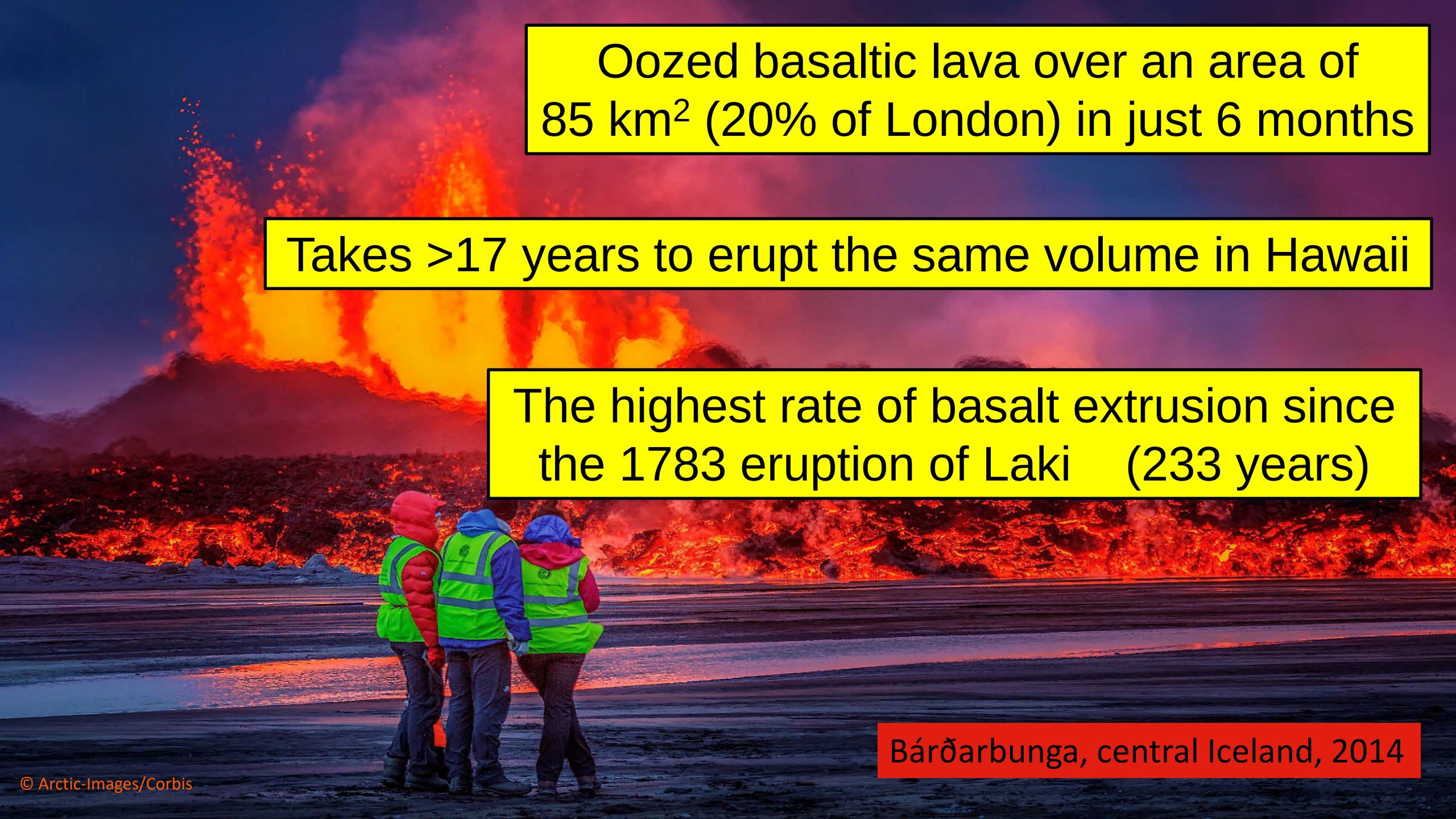


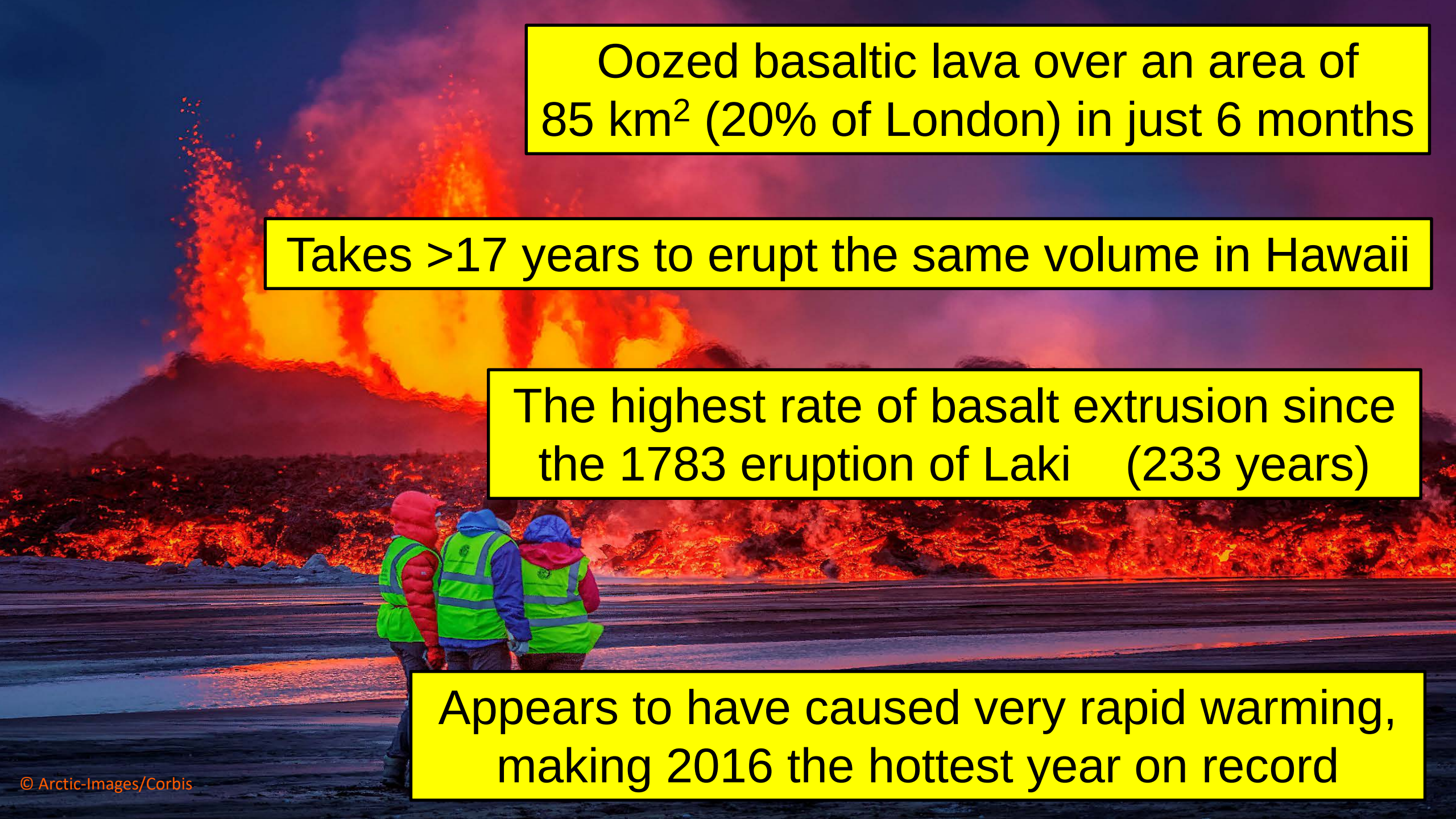
Licciardi et al., 2007

Bárðarbunga, central Iceland, 2014


Oozed basaltic lava over an area of
85 km² (20% of London) in just 6 months
Bárðarbunga, central Iceland, 2014
© Arctic-Images/Corbis


Oozed basaltic lava over an area of
85 km^2 (20% of London) in just 6 months
Takes >17 years to erupt the same volume in Hawaii
Bárðarbunga, central Iceland, 2014
© Arctic-Images/Corbis


Oozed basaltic lava over an area of 85 km^2 (20% of London) in just 6 months
Takes >17 years to erupt the same volume in Hawaii
The highest rate of basalt extrusion since the 1783 eruption of Laki (233 years)
Bárðarbunga, central Iceland, 2014
© Arctic-Images/Corbis



Oozed basaltic lava over an area of 85 km^2 (20% of London) in just 6 months

Takes >17 years to erupt the same volume in Hawaii

The highest rate of basalt extrusion since the 1783 eruption of Laki (233 years)

Appears to have caused very rapid warming, making 2016 the hottest year on record

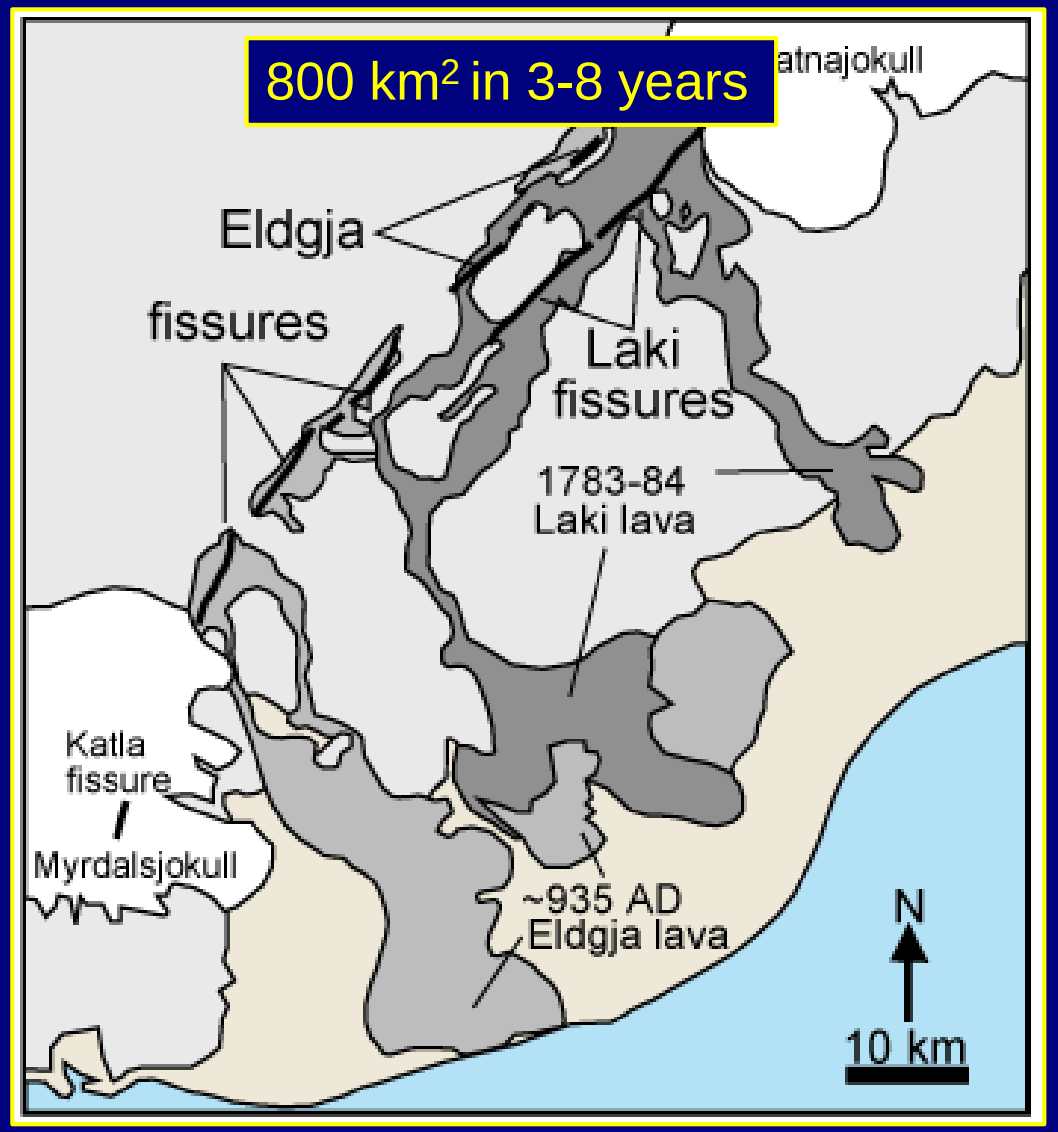
Other historic major effusive volcanic eruptions

Other historic major effusive volcanic eruptions

Laki 1783

Other historic major effusive volcanic eruptions

Laki 1783

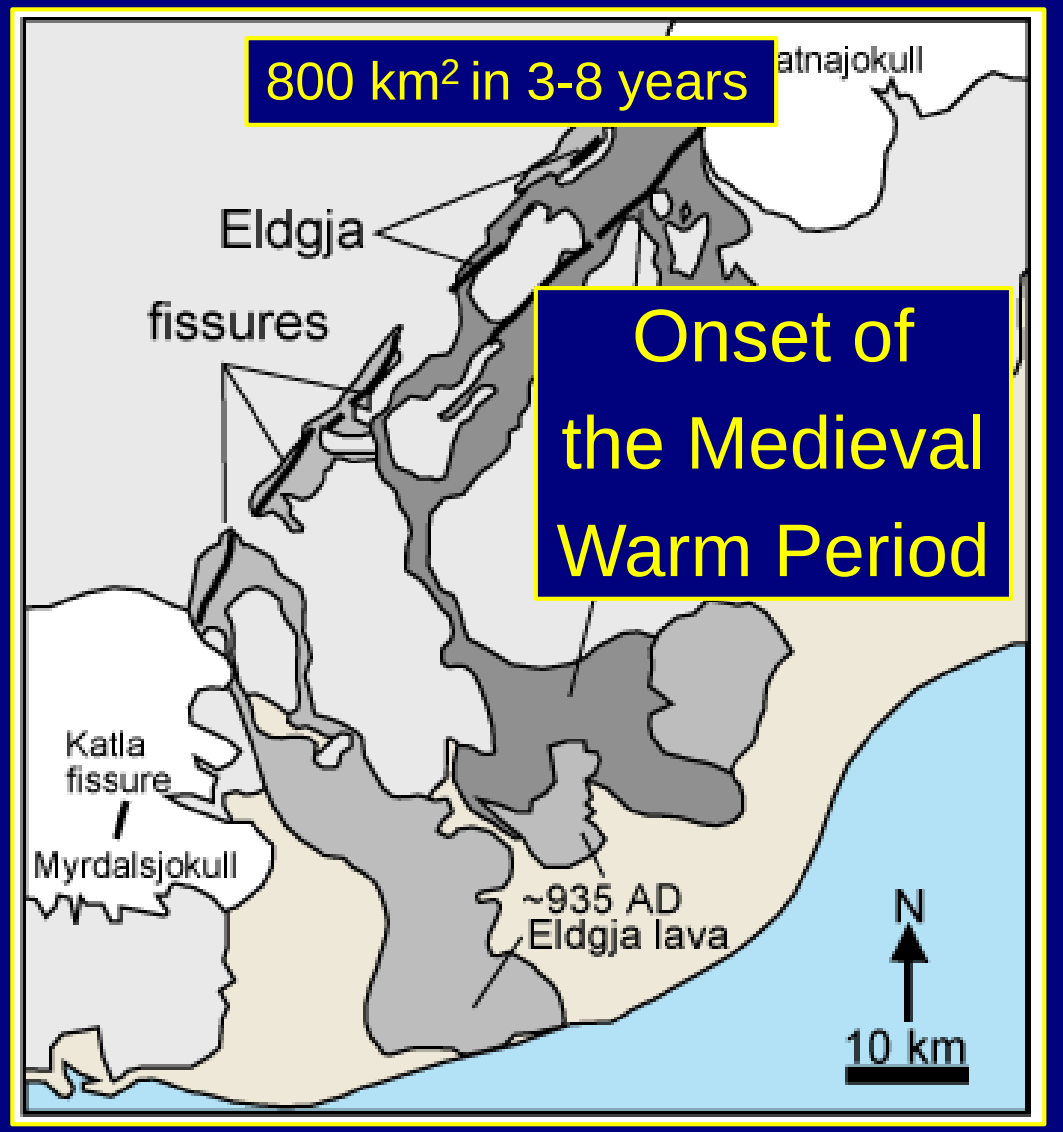


Eldgjá 935

volcano.oregonstate.edu

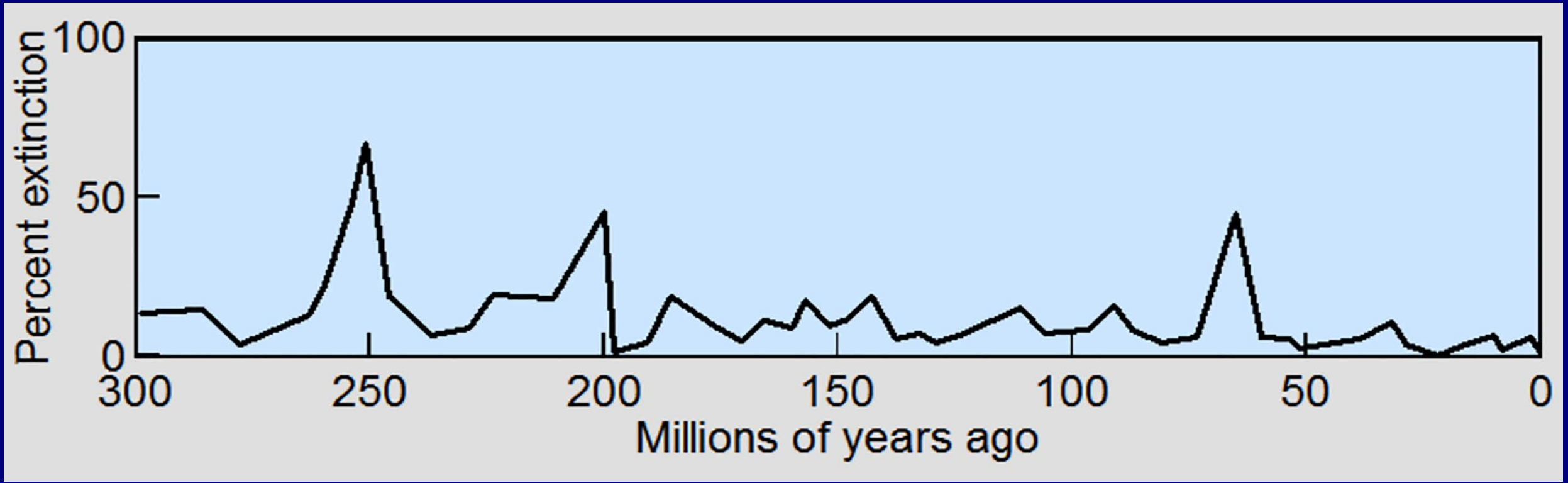
Other historic major effusive volcanic eruptions

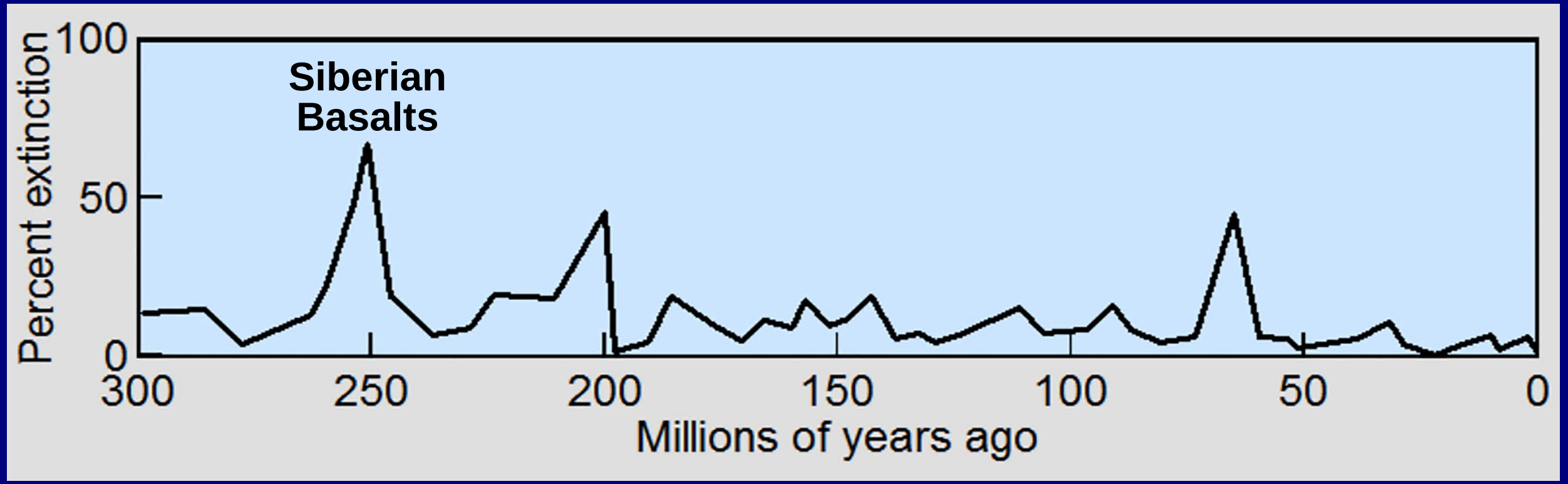
Laki 1783



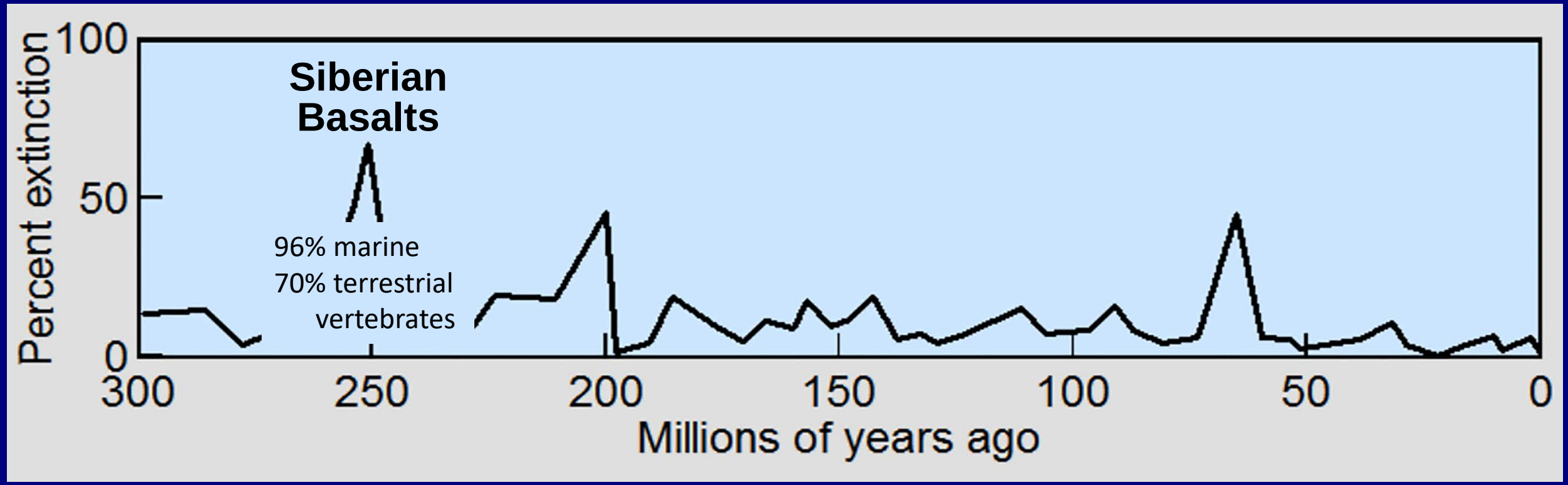
Eldgjá 935

volcano.oregonstate.edu

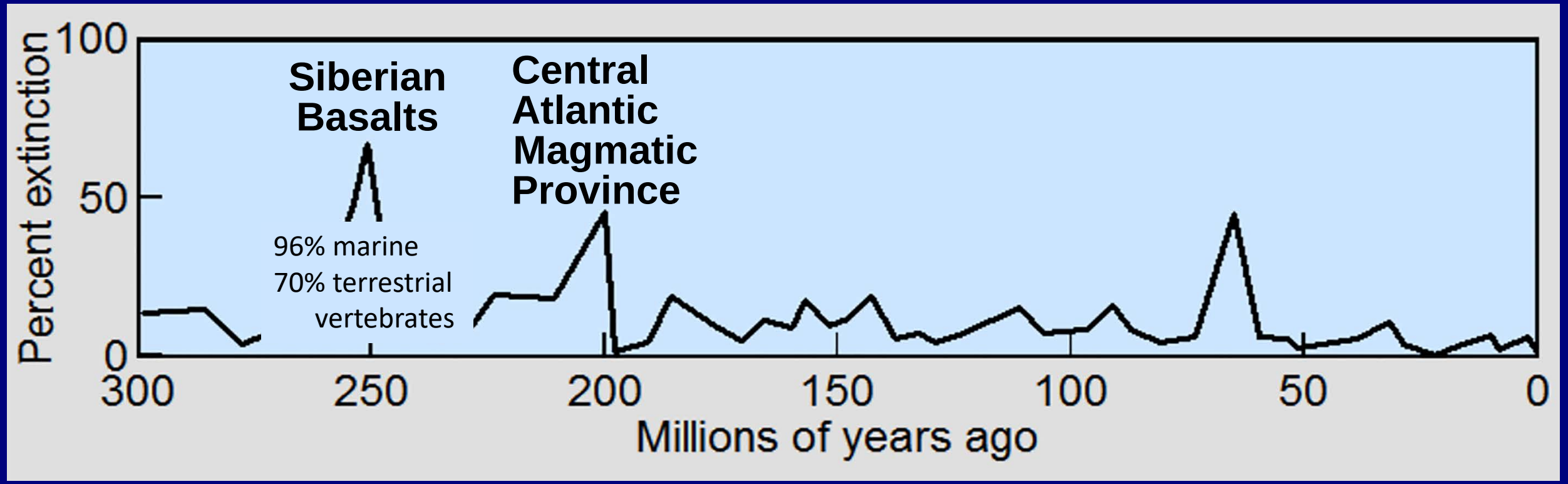

Percent extinction
100
50
0
300
250
200
150
100
50
0
Millions of years ago


Siberian Basalts
Percent extinction
100
50
0
300
250
200
150
100
50
0
Millions of years ago

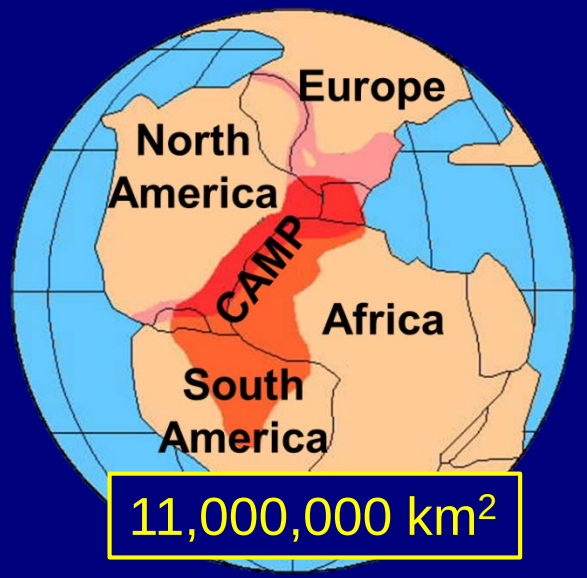

Arctic Ocean
Finland
Санкт-Петербург
Moscow
Волгоград
Якутск
Sea of Okhotsk
Lake Baikal
Caspian Sea
Siberian Basalts
7,000,000 km²

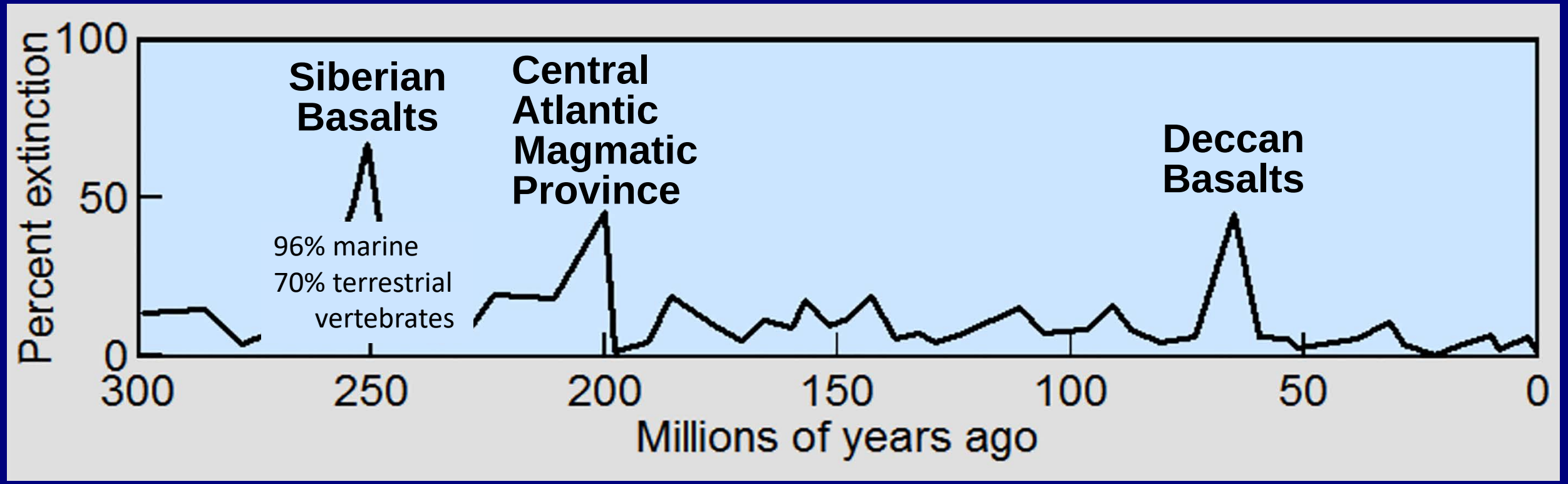

Siberian Basalts
96% marine
70% terrestrial vertebrates
Percent extinction
100
50
0
300
250
200
150
100
50
0
Millions of years ago


Arctic Ocean
Finland
Санкт-Петербург
Moscow
Волгоград
Якутск
Sea of Okhotsk
Lake Baikal
Caspian Sea
Siberian Basalts
7,000,000 km²

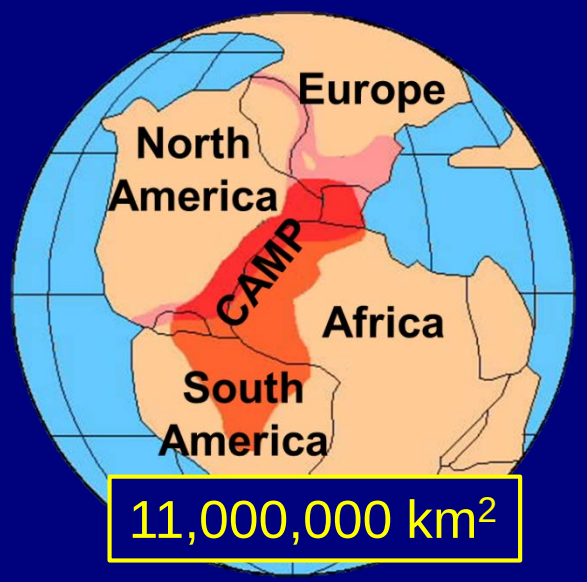

Percent extinction
100
50
0
Siberian Basalts
96% marine
70% terrestrial vertebrates
Central Atlantic Magmatic Province
300
250
200
150
100
50
0
Millions of years ago

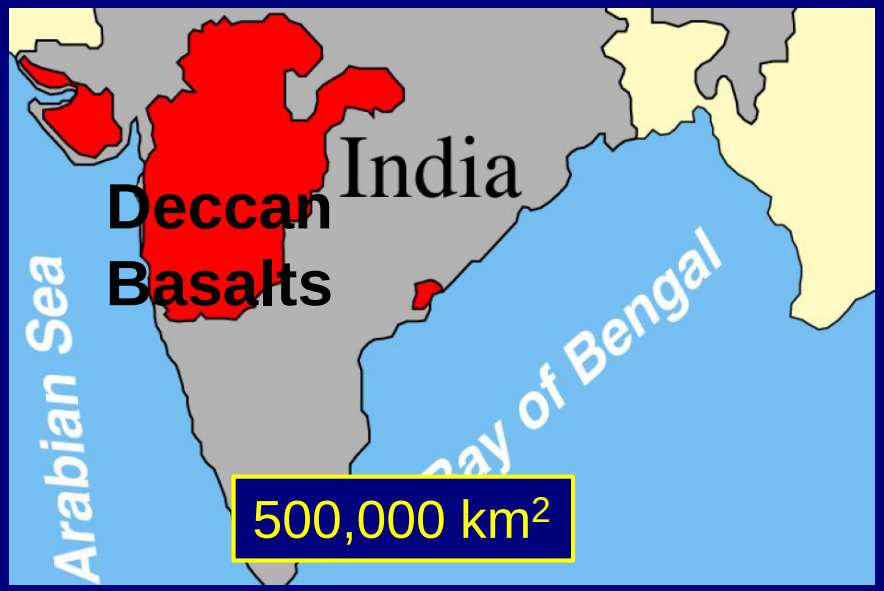

Arctic Ocean
Finland
Санкт-Петербург
Moscow
Волгоград
Сибирское море
Баренцево море
Новая Земля
Карское море
море Лаптевых
Восточно-Сибирская низменность
Восточносибирские го
Якутск
Sea of Okhotsk
Lake Baikal
Caspian Sea
Siberian Basalts
7,000,000 km²


Europe
North America
CAMP
Africa
South America
11,000,000 km²


Percent extinction
100
50
0
Siberian Basalts
96% marine
70% terrestrial vertebrates
Central Atlantic Magmatic Province
Deccan Basalts
300
250
200
150
100
50
0
Millions of years ago


Arctic Ocean
Finland
Санкт-Петербург
Moscow
Волгоград
Caspian Sea
Sea of Okhotsk
Якутск
Lake Baikal
Siberian Basalts
7,000,000 km²


Europe
North America
CAMP
Africa
South America
11,000,000 km²


India
Deccan Basalts
Arabian Sea
Bay of Bengal
500,000 km²

Major effusive volcanic eruptions

Extrude basaltic lava over large areas

Major effusive volcanic eruptions

Extrude basaltic lava over large areas

Do not explode much debris into the stratosphere

Major effusive volcanic eruptions

Extrude basaltic lava over large areas

Do not explode much debris into the stratosphere

Last for months to hundreds of thousands of years

Major effusive volcanic eruptions

Extrude basaltic lava over large areas

Do not explode much debris into the stratosphere

Last for months to hundreds of thousands of years

Deplete ozone causing global warming

Major effusive volcanic eruptions

Extrude basaltic lava over large areas

Do not explode much debris into the stratosphere

Last for months to hundreds of thousands of years

Deplete ozone causing global warming

Acidify the oceans and cause major mass extinctions

Major effusive volcanic eruptions

Extrude basaltic lava over large areas

Do not explode much debris into the stratosphere

Last for months to hundreds of thousands of years

Deplete ozone causing global warming

Acidify the oceans and cause major mass extinctions

Cause minor to extreme climate change

Major explosive volcanic eruptions

Major explosive volcanic eruptions

Typically erupt only for days
but may recur within 500 to 1000 years

Major explosive volcanic eruptions

Typically erupt only for days
but may recur within 500 to 1000 years

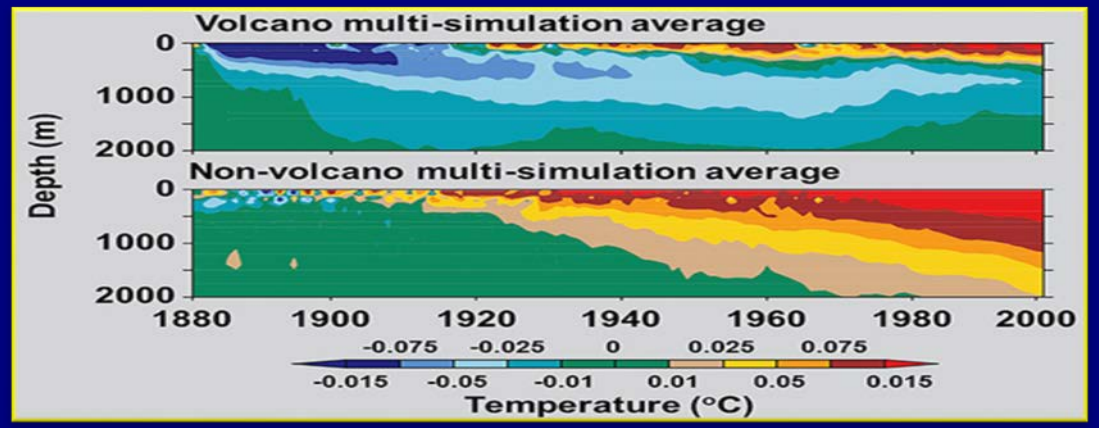
Form aerosols that last for 2 to 4 years
that reflect and scatter solar energy,
causing net global cooling

Major explosive volcanic eruptions

Typically erupt only for days
but may recur within 500 to 1000 years

Form aerosols that last for 2 to 4 years
that reflect and scatter solar energy,
causing net global cooling

Krakatau cooled ocean
for more than 100 years



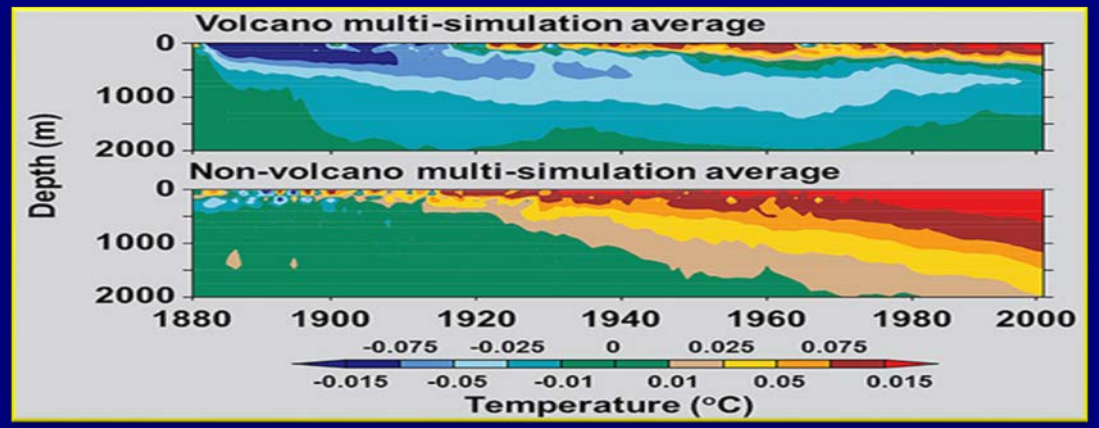
Gleckler et al., 2006

Major explosive volcanic eruptions

Typically erupt only for days
but may recur within 500 to 1000 years

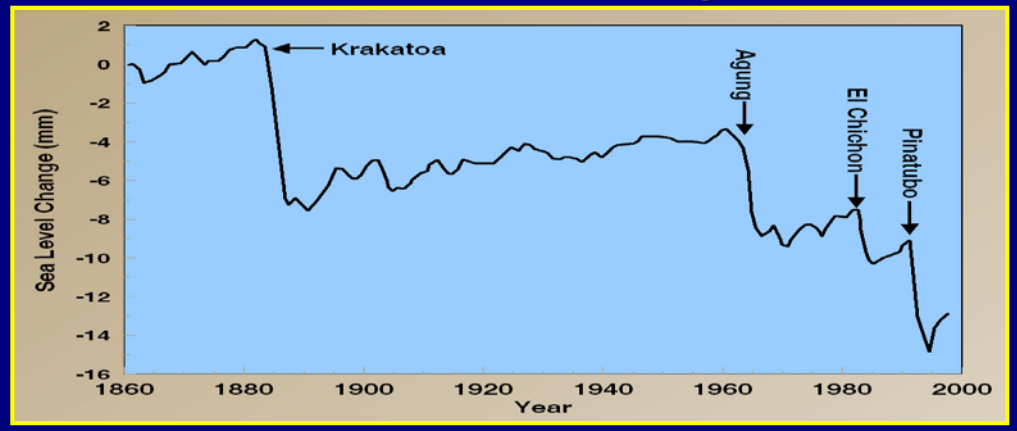
Form aerosols that last for 2 to 4 years
that reflect and scatter solar energy,
causing net global cooling

Krakatau cooled ocean
for more than 100 years



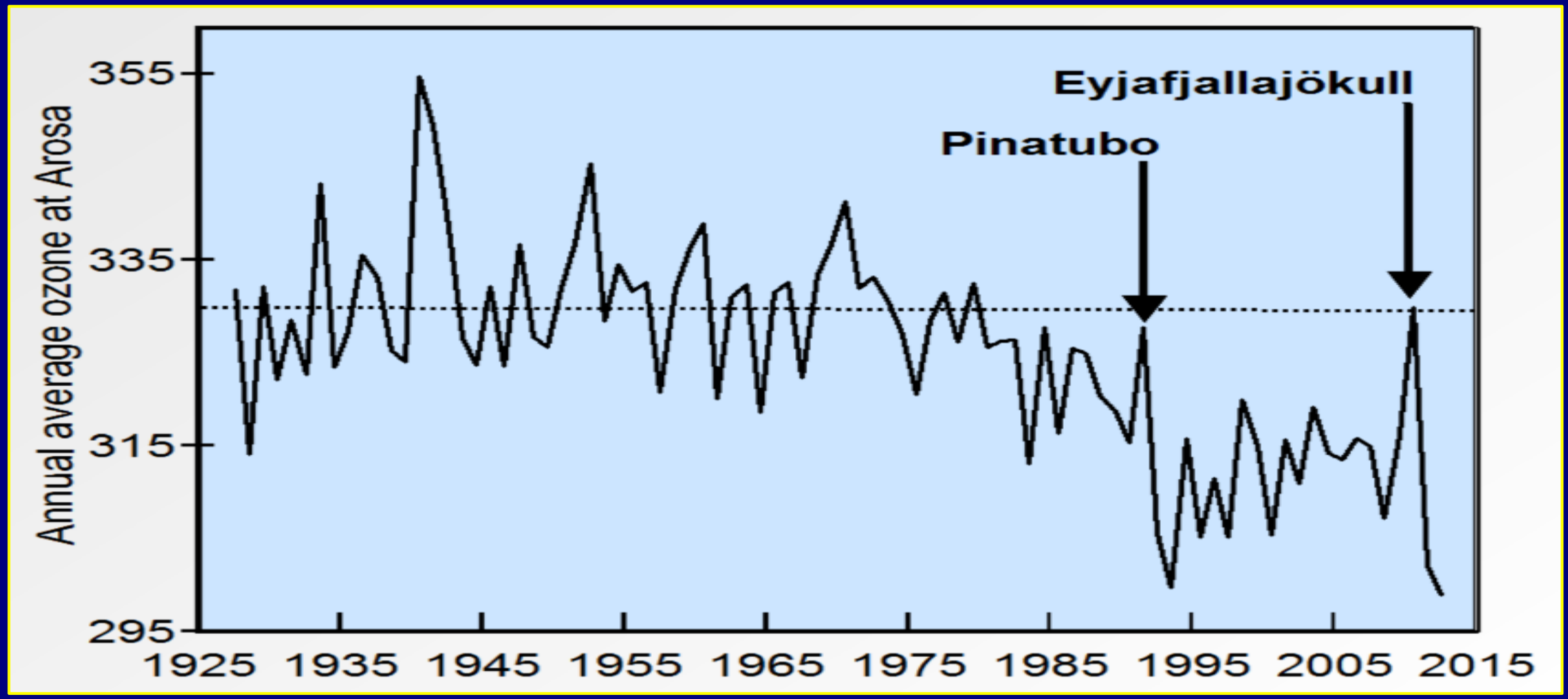
Gleckler et al., 2006

Multiple eruptions increment
world into ice age

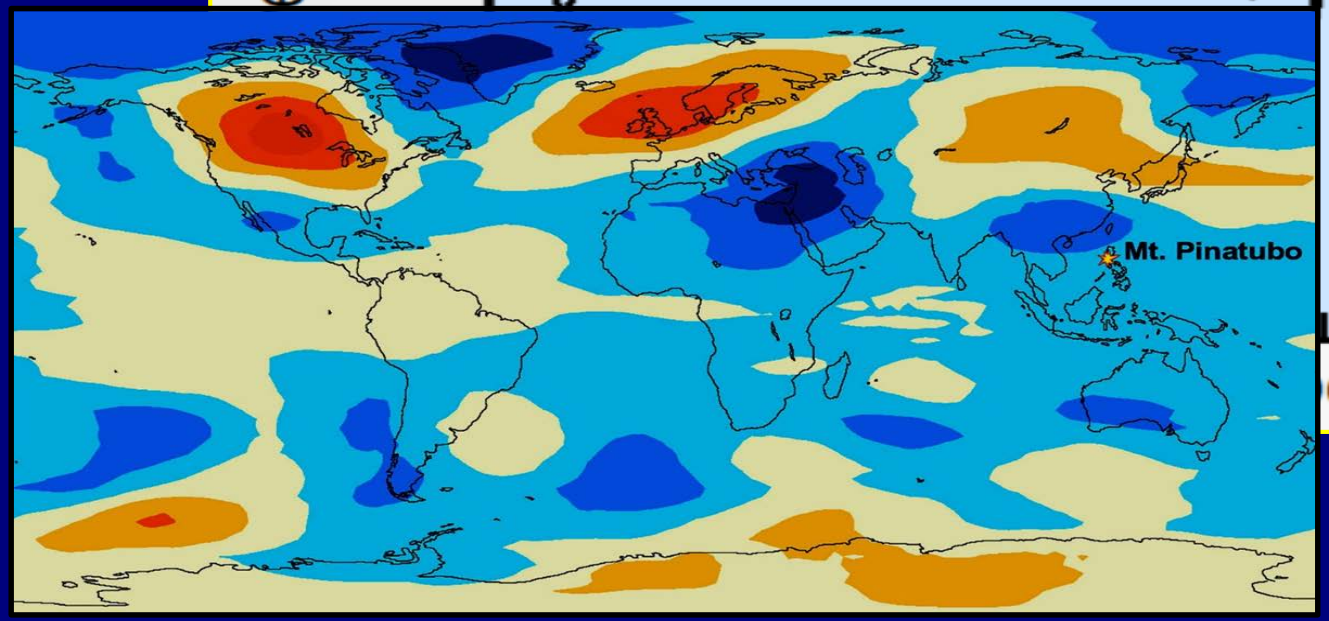


Gregory et al., 2006

Annual average total column ozone at Arosa Switzerland



Annual average total column ozone at Arosa Switzerland

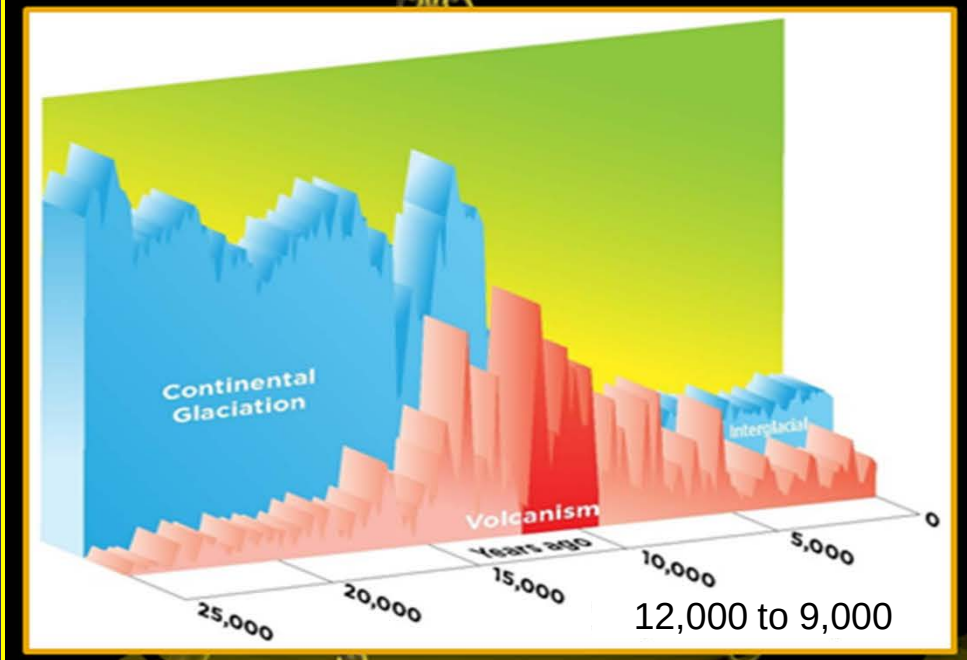


Robock, 2002

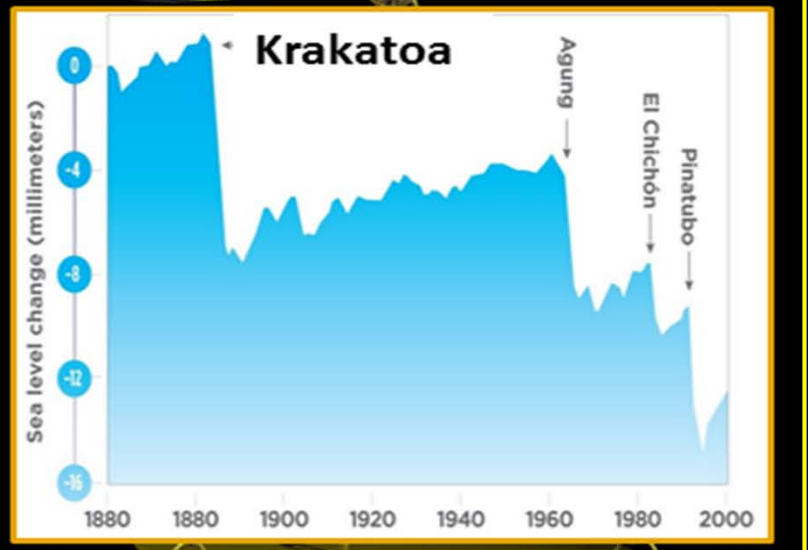
As much as 3.5°C
Dec 1991 to Feb 1992

Global Warming

Global Cooling



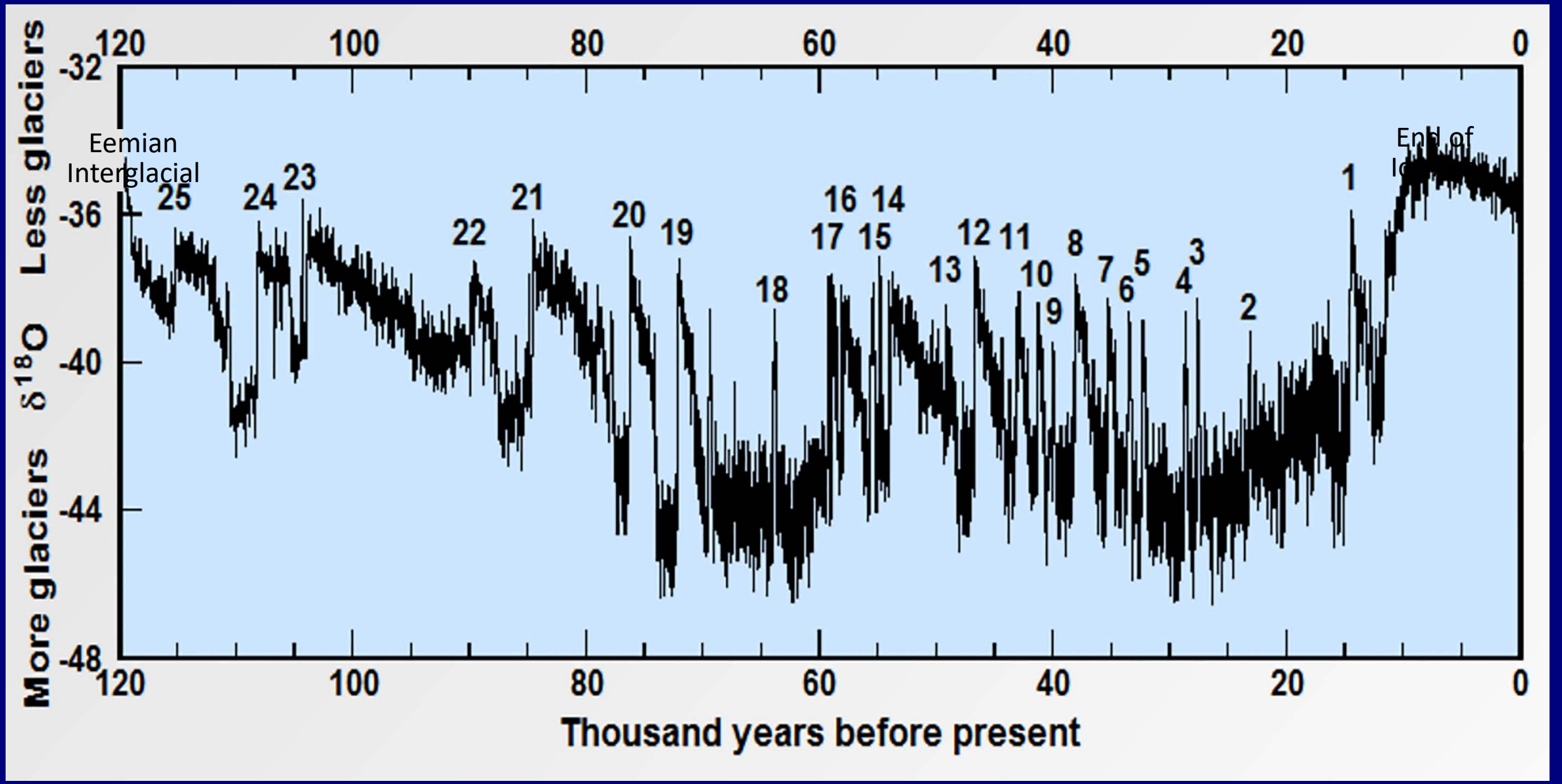
12,000 to 9,000



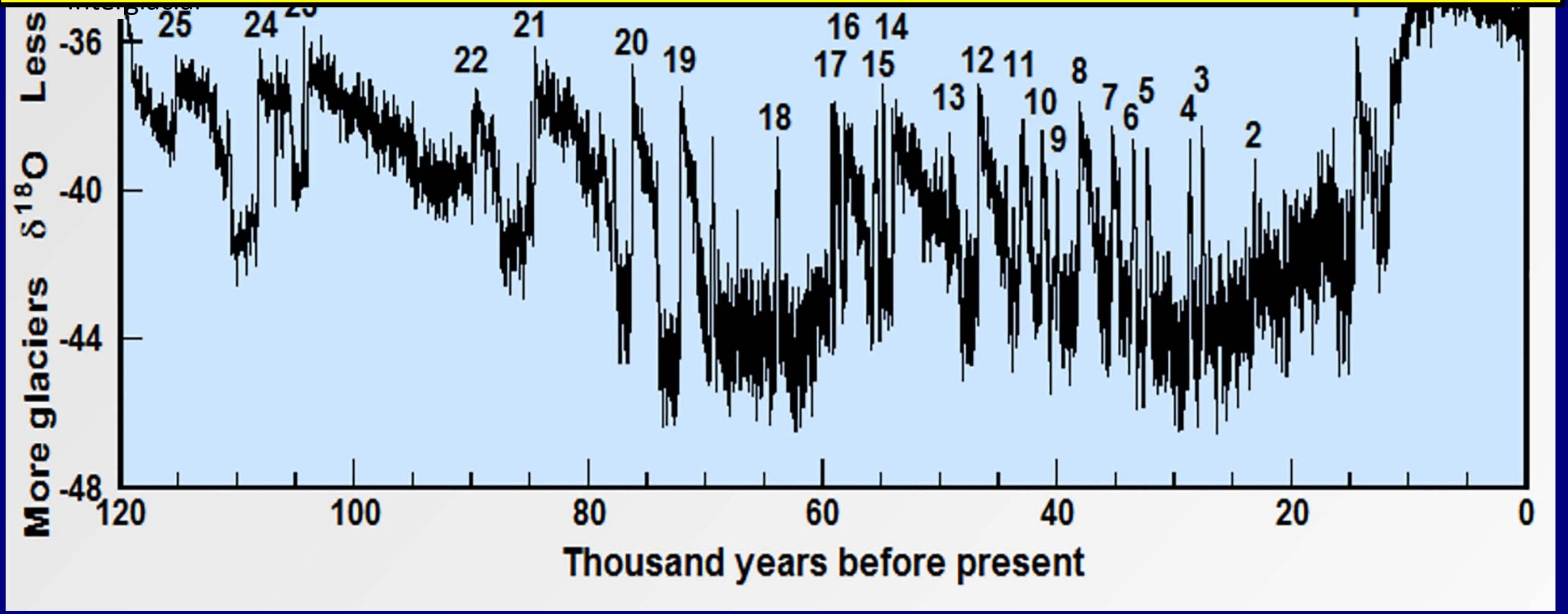
Duration of effusive volcanism

Frequency of explosive volcanism

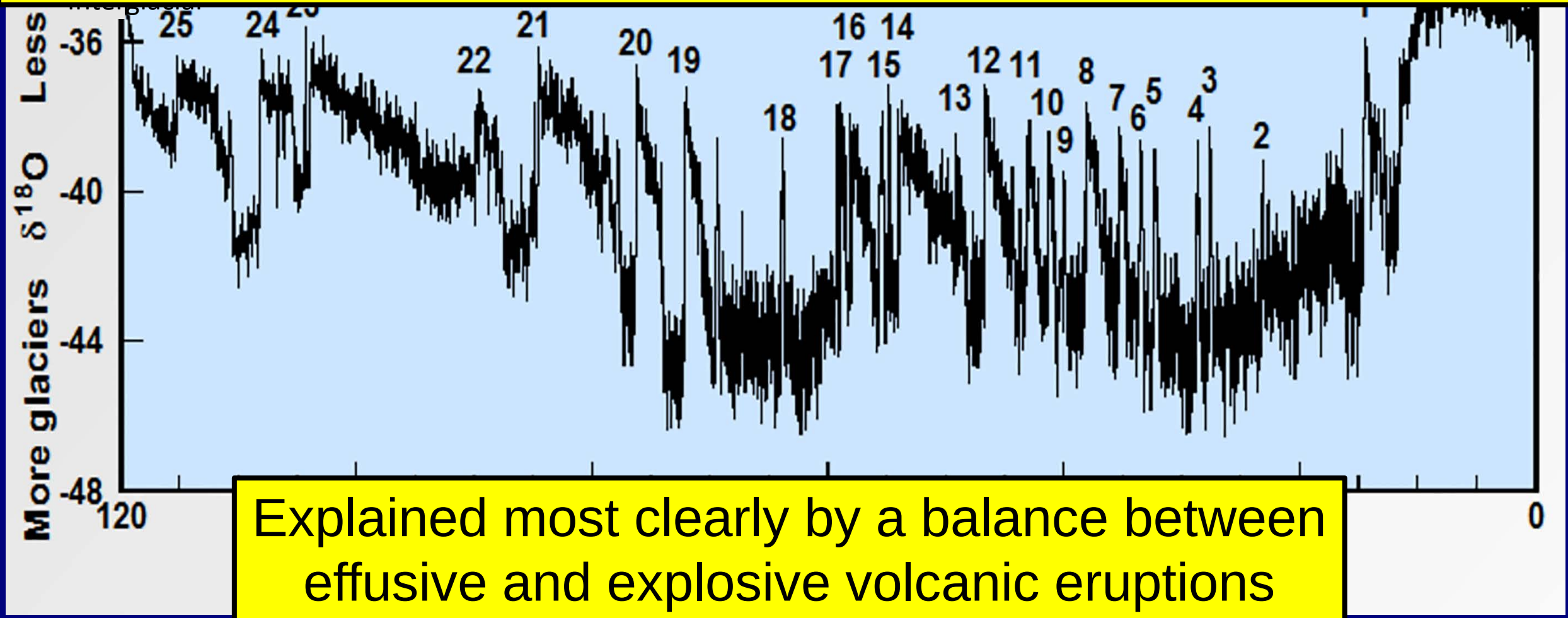
Erratic cycles of rapid warming followed by slower cooling



Sudden major warming within a few years followed by cumulative cooling over centuries to millennia where the warming and cooling occurs on average every 5000 years, but the timing and amount of warming are erratic, not in cycles

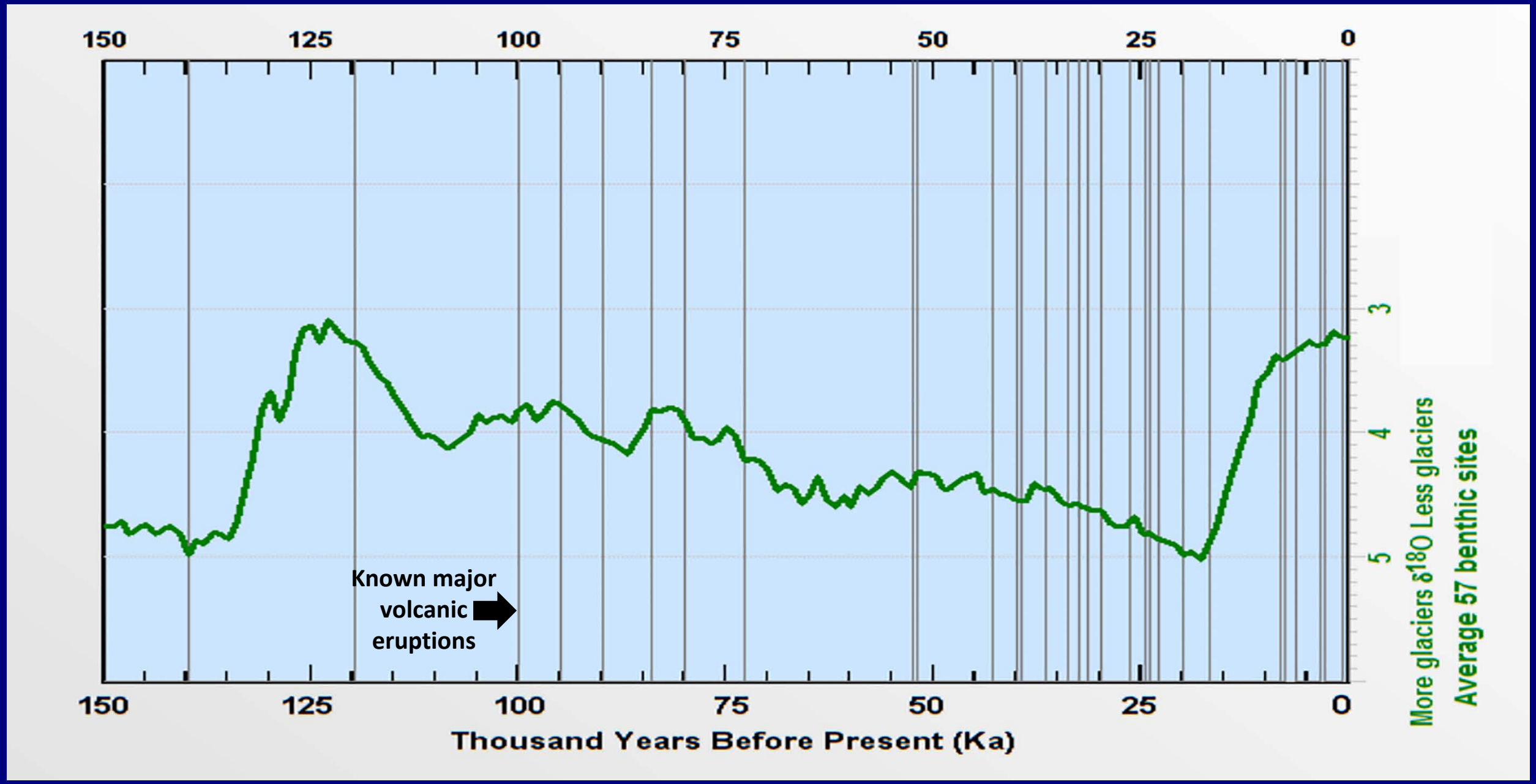


Sudden major warming within a few years followed by cumulative cooling over centuries to millennia where the warming and cooling occurs on average every 5000 years, but the timing and amount of warming are erratic, not in cycles

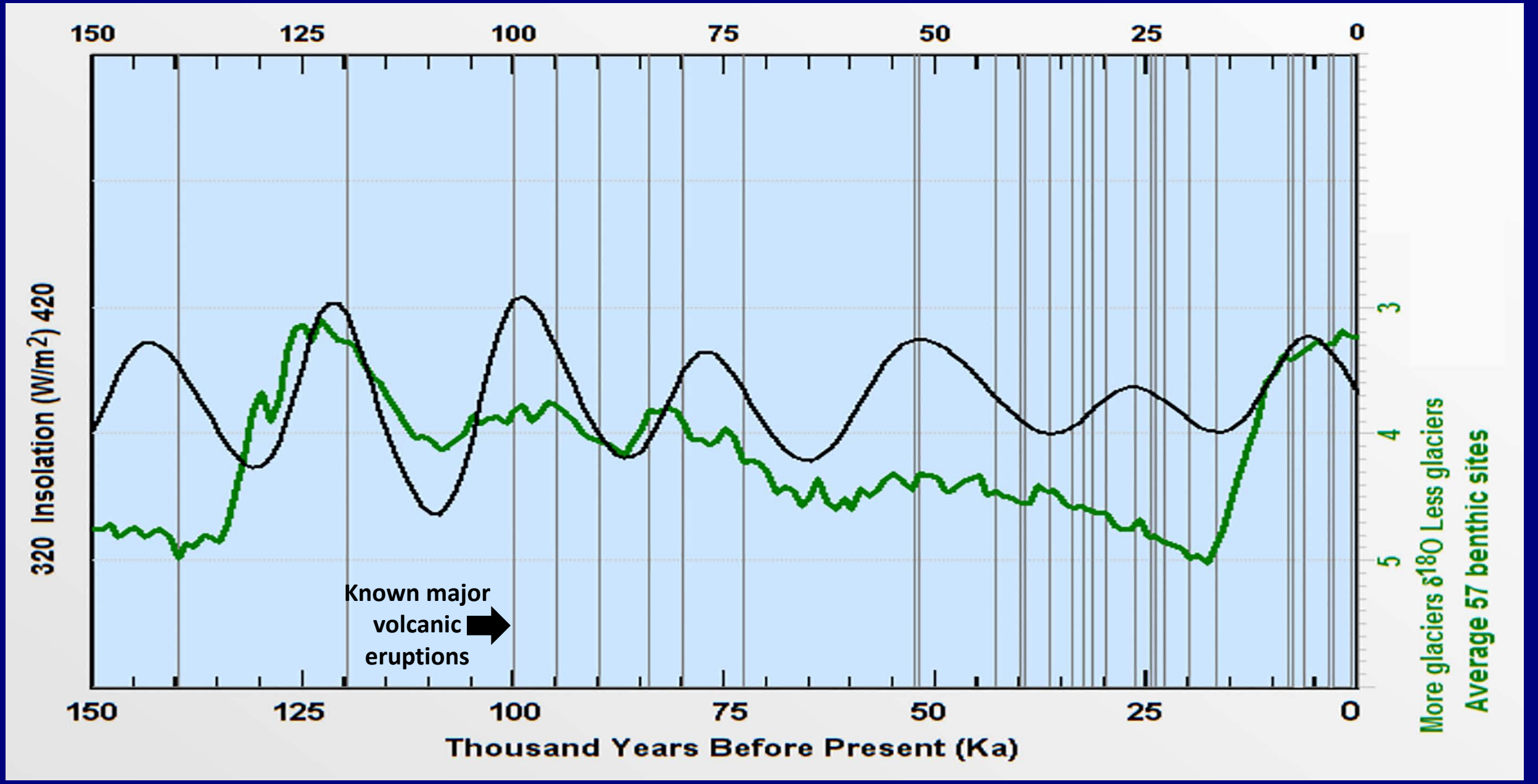


Explained most clearly by a balance between effusive and explosive volcanic eruptions

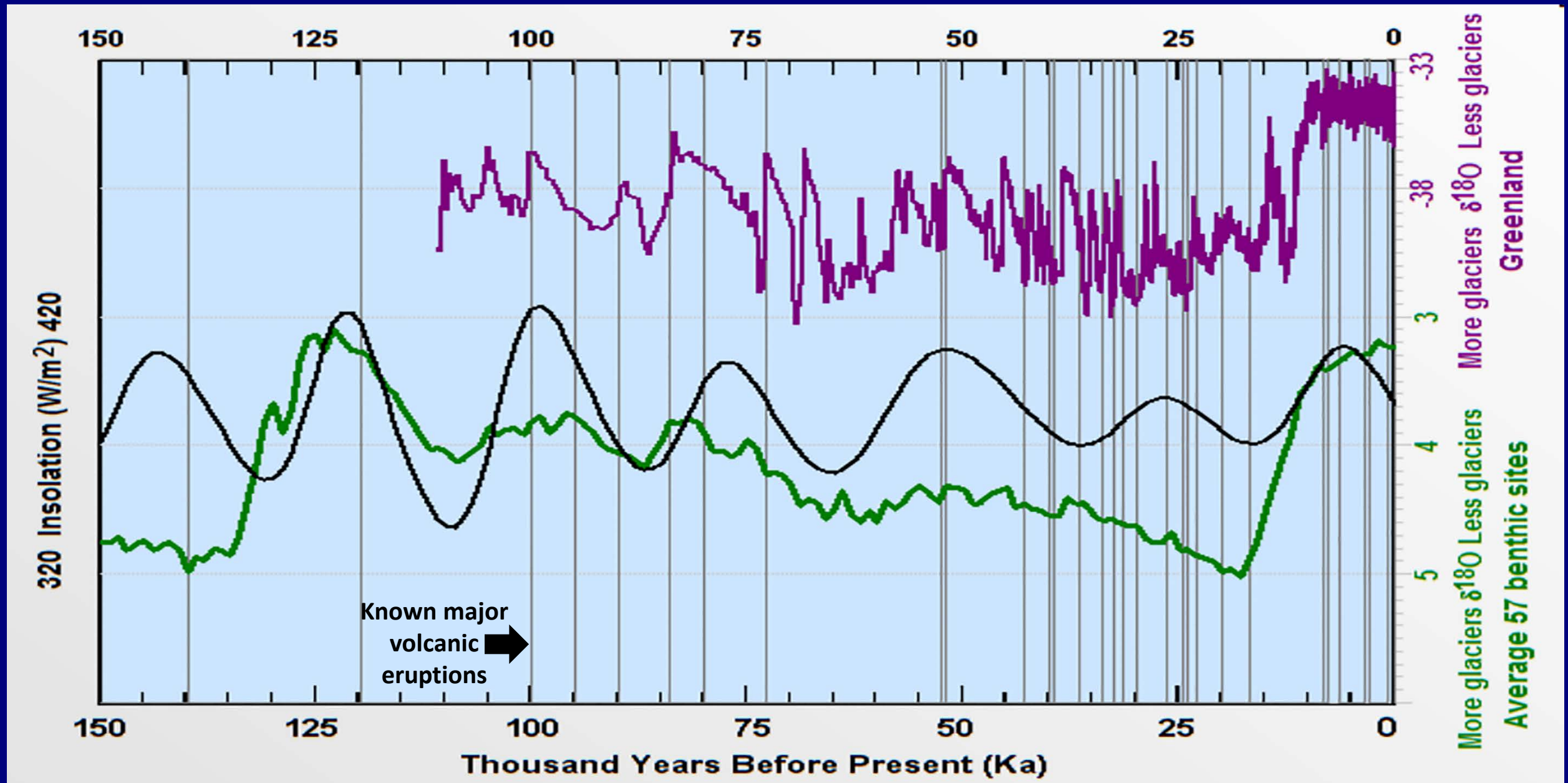
We have to be very careful about “cycles”



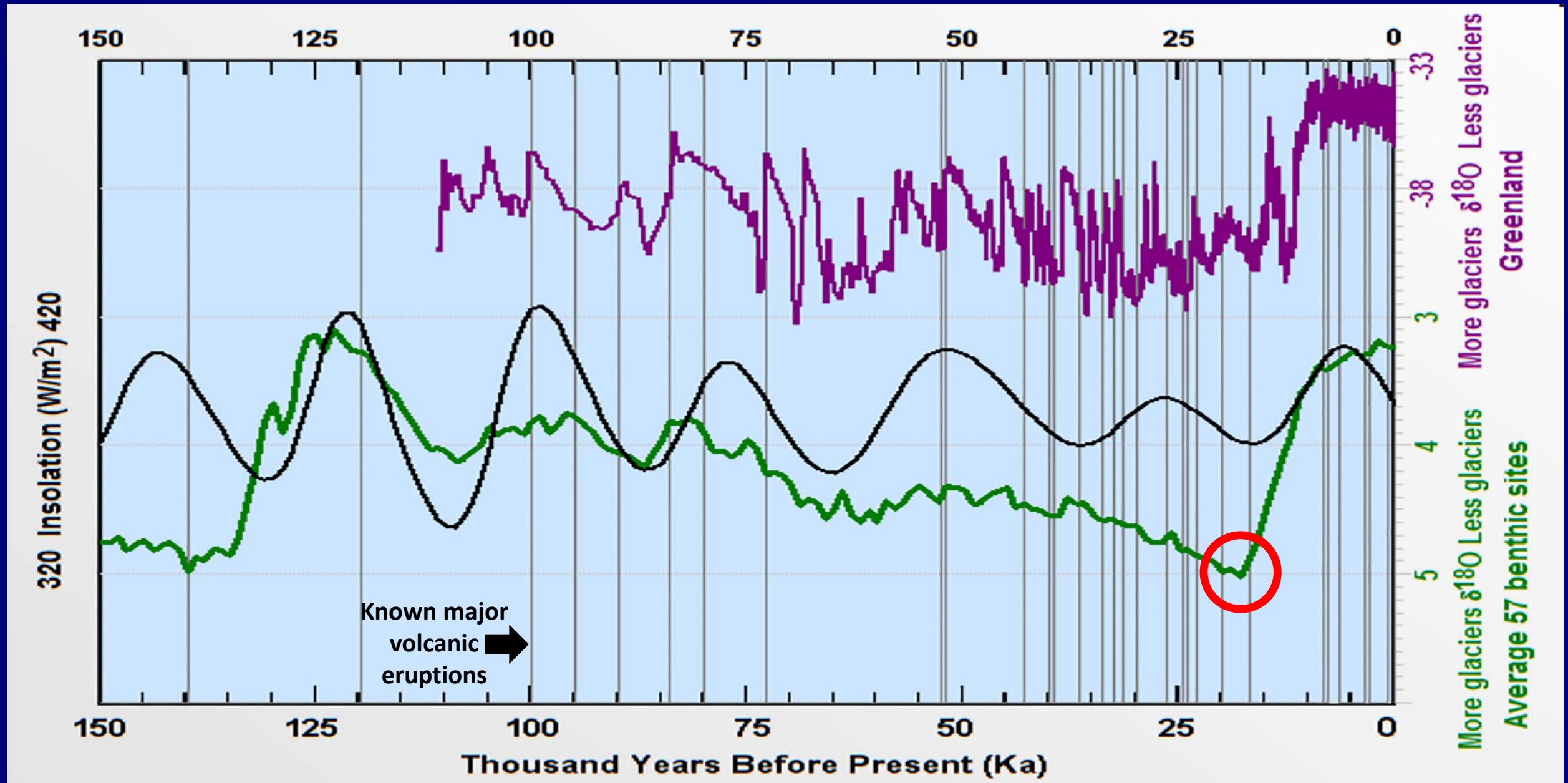
We have to be very careful about “cycles”



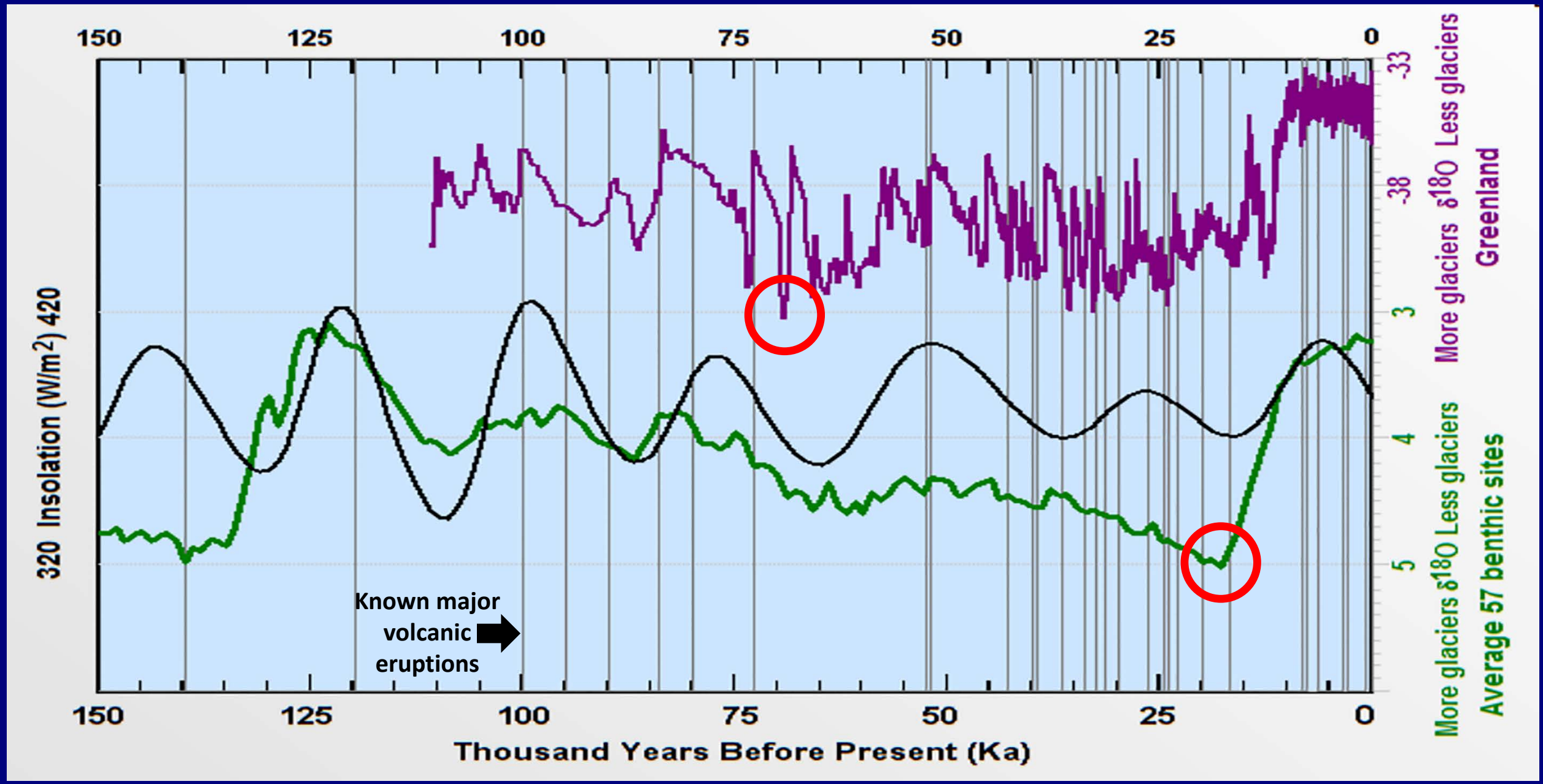
We have to be very careful about “cycles”



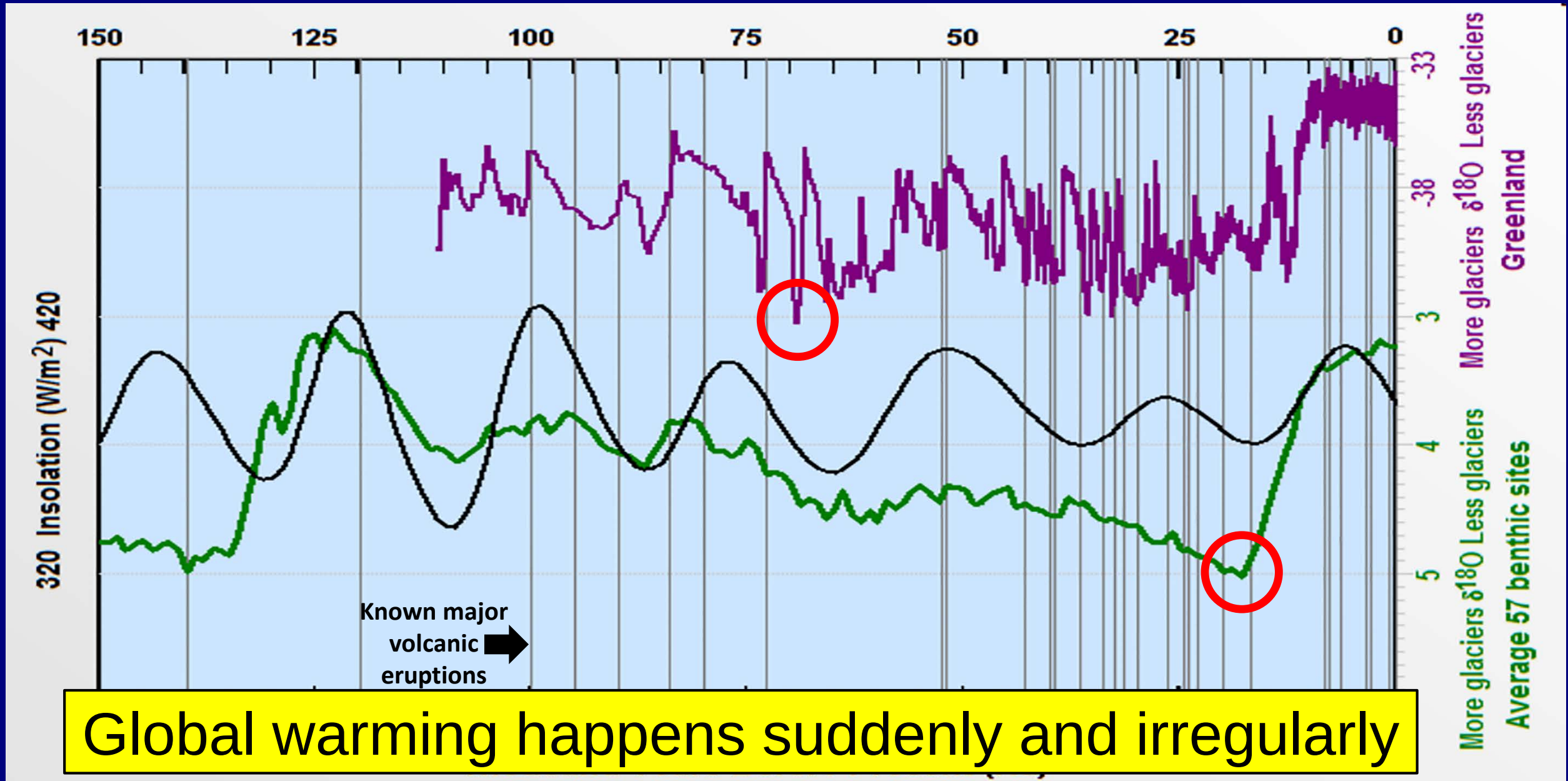
We have to be very careful about “cycles”



We have to be very careful about “cycles”



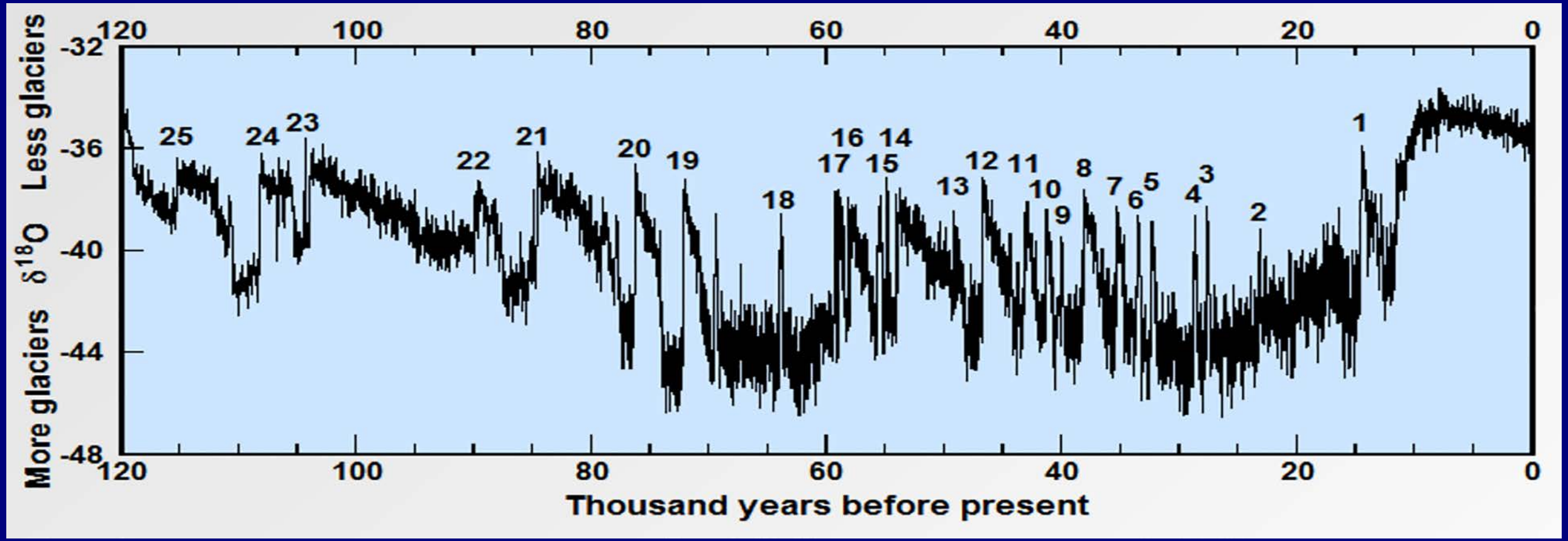
We have to be very careful about “cycles”



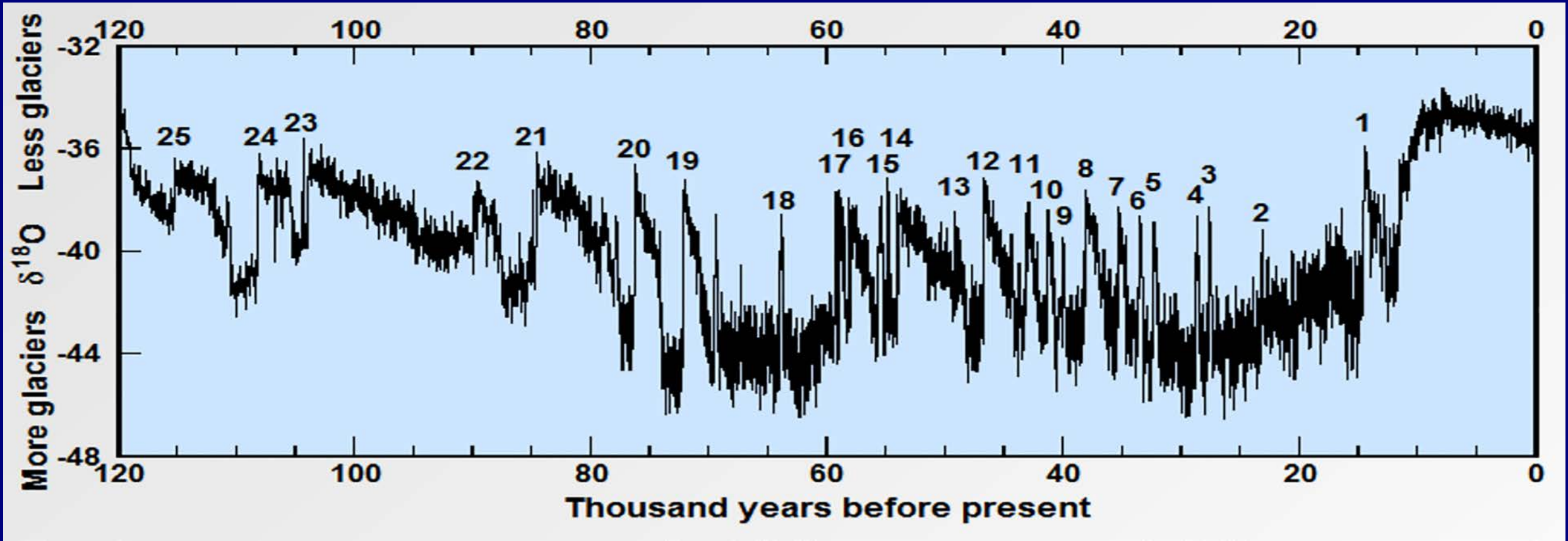
Global warming happens suddenly and irregularly

The closest thing to truth in science is good data

The closest thing to truth in science is good data

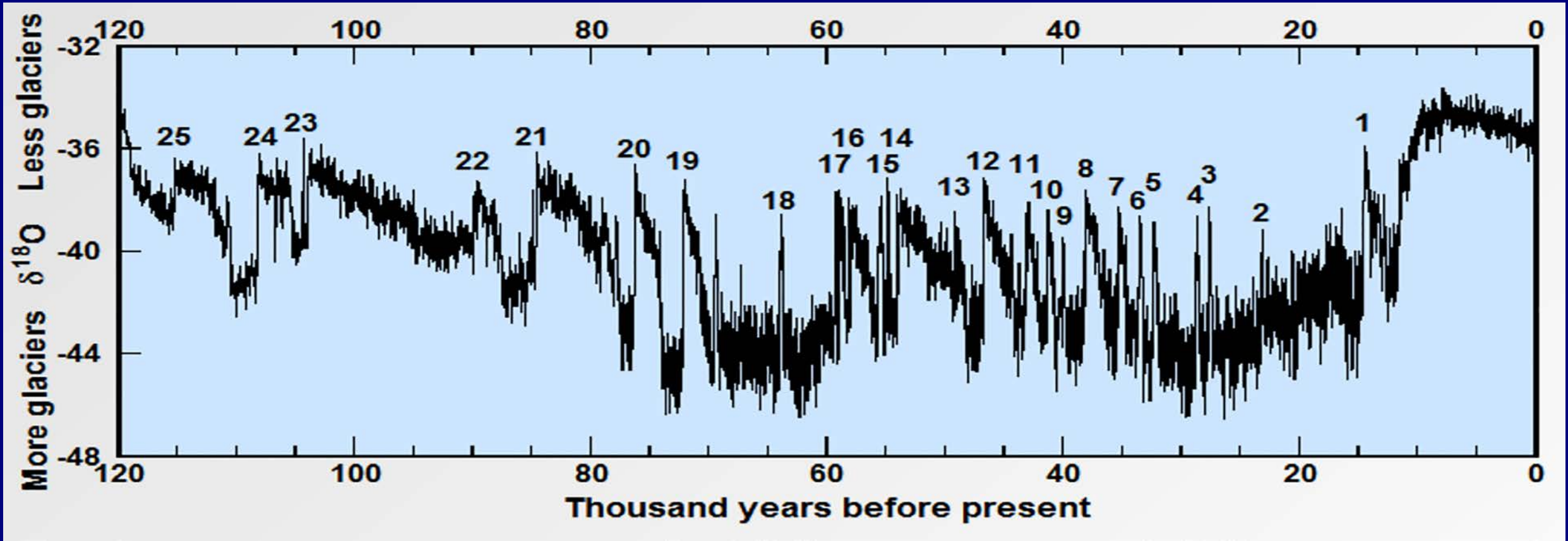


The closest thing to truth in science is good data



Erratic sequences of rapid warming followed by slower cooling

The closest thing to truth in science is good data



Erratic sequences of rapid warming followed by slower cooling

The “New Dawn of Truth” is recognizing that a valid theory of climate change must explain these erratic sequences

Al Gore said in “An Inconvenient Truth”

Al Gore said in “An Inconvenient Truth”

“Scientists have an independent obligation to respect and present the truth as they see it.”

Al Gore said in “An Inconvenient Truth”

“Scientists have an independent obligation to respect and present the truth as they see it.”

The truth, as I see it, is that climate change throughout Earth history warms suddenly and cools slowly in erratic sequences that are not cyclic

Al Gore said in “An Inconvenient Truth”

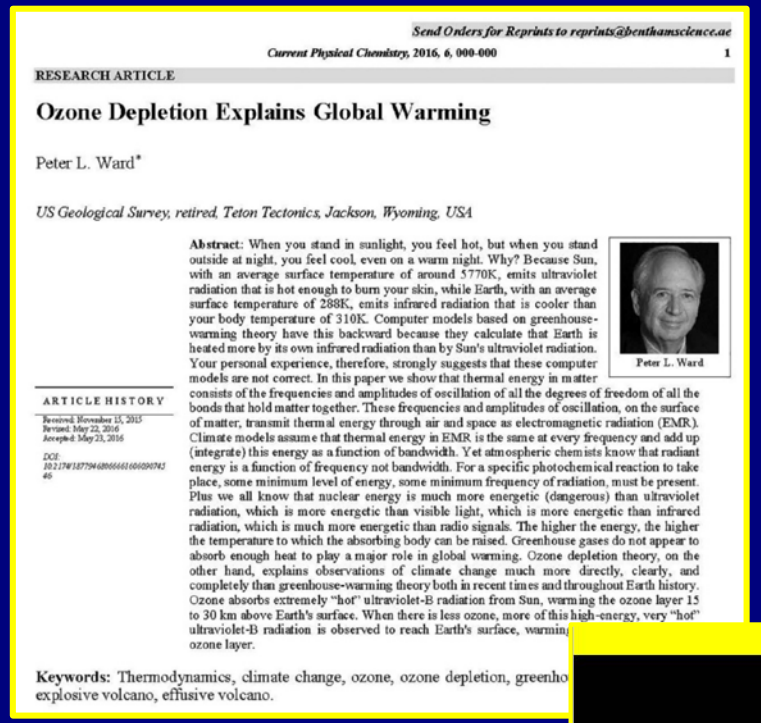
“Scientists have an independent obligation to respect and present the truth as they see it.”

The truth, as I see it, is that climate change throughout Earth history warms suddenly and cools slowly in erratic sequences that are not cyclic

A valid theory of climate change must explain these erratic sequences

Book

Peer-reviewed paper



Send Orders for Reprints to reprints@benthamscience.ae

Current Physical Chemistry, 2016, 6, 000-000 1

RESEARCH ARTICLE

Ozone Depletion Explains Global Warming

Peter L. Ward*

US Geological Survey, retired, Teton Tectonics, Jackson, Wyoming, USA

Abstract: When you stand in sunlight, you feel hot, but when you stand outside at night, you feel cool, even on a warm night. Why? Because Sun, with an average surface temperature of around 5770K, emits ultraviolet radiation that is hot enough to burn your skin, while Earth, with an average surface temperature of 288K, emits infrared radiation that is cooler than your body temperature of 310K. Computer models based on greenhouse-warming theory have this backward because they calculate that Earth is heated more by its own infrared radiation than by Sun's ultraviolet radiation. Your personal experience, therefore, strongly suggests that these computer models are not correct. In this paper we show that thermal energy in matter consists of the frequencies and amplitudes of oscillation of all the degrees of freedom of all the bonds that hold matter together. These frequencies and amplitudes of oscillation, on the surface of matter, transmit thermal energy through air and space as electromagnetic radiation (EMR). Climate models assume that thermal energy in EMR is the same at every frequency and add up (integrate) this energy as a function of bandwidth. Yet atmospheric chemists know that radiant energy is a function of frequency not bandwidth. For a specific photochemical reaction to take place, some minimum level of energy, some minimum frequency of radiation, must be present. Plus we all know that nuclear energy is much more energetic (dangerous) than ultraviolet radiation, which is more energetic than visible light, which is more energetic than infrared radiation, which is much more energetic than radio signals. The higher the energy, the higher the temperature to which the absorbing body can be raised. Greenhouse gases do not appear to absorb enough heat to play a major role in global warming. Ozone depletion theory, on the other hand, explains observations of climate change much more directly, clearly, and completely than greenhouse-warming theory both in recent times and throughout Earth history. Ozone absorbs extremely "hot" ultraviolet-B radiation from Sun, warming the ozone layer 15 to 30 km above Earth's surface. When there is less ozone, more of this high-energy, very "hot" ultraviolet-B radiation is observed to reach Earth's surface, warmin[g] ozone layer.

Peter L. Ward

ARTICLE HISTORY

Received: November 15, 2015
Revised: May 22, 2016
Accepted: May 23, 2016

DOI: 10.2174/1877946806666160606045 46

Keywords: Thermodynamics, climate change, ozone, ozone depletion, greenho explosive volcano, effusive volcano.

Email

peward@wyoming.com

Website

WhyClimateChanges.com

Plea to scientists

ClimatePlea.com

Includes:
Extensive webpages
Scientific papers
Talks
Videos
Press releases
Etc.