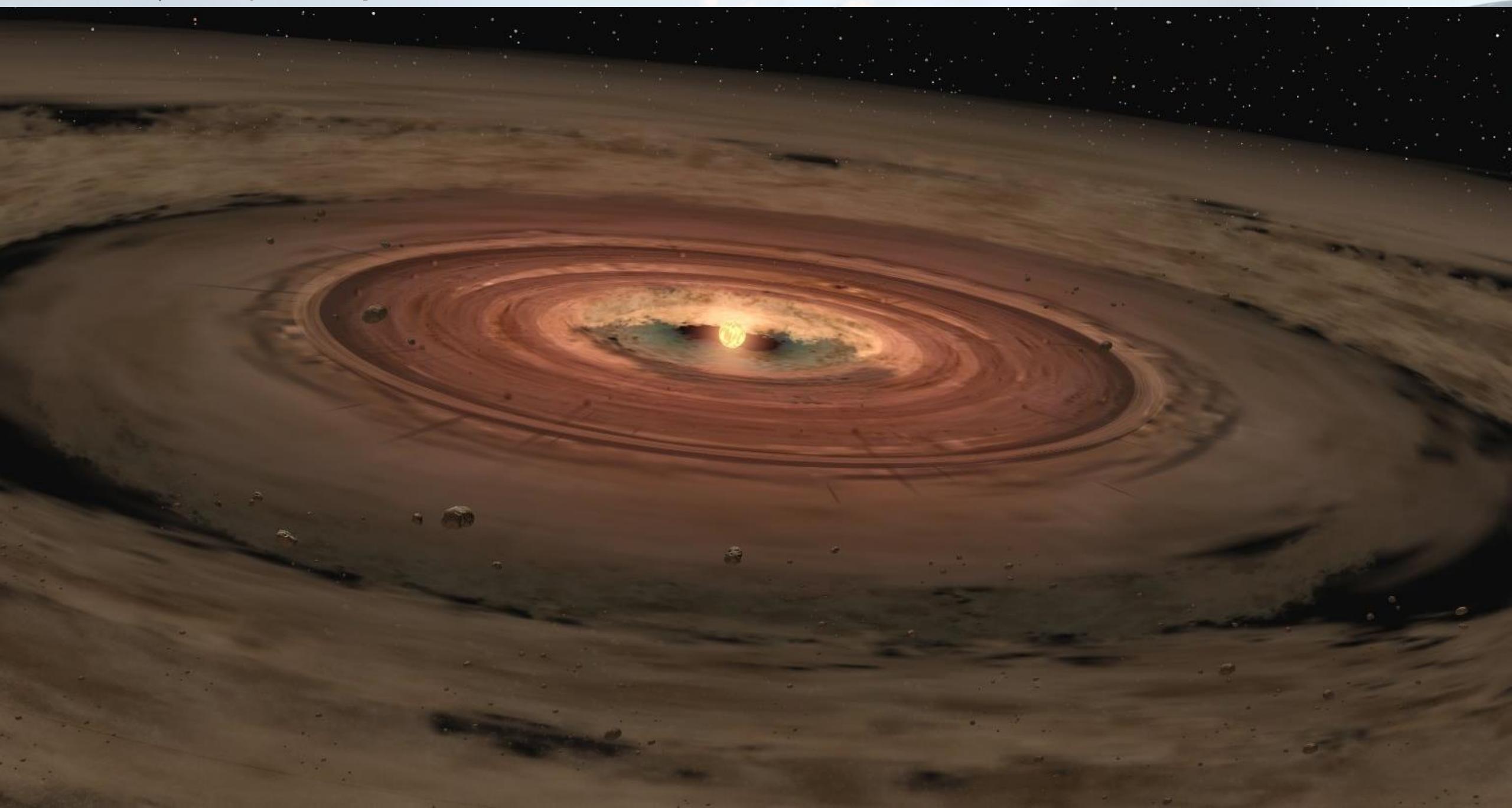
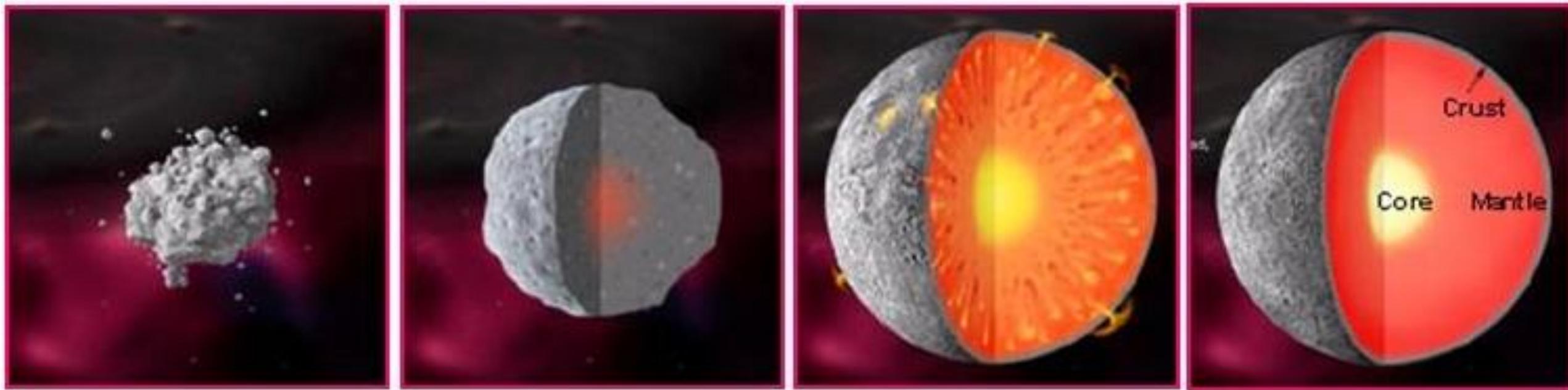




GY4051 Earth Science and Society

Volcanoes

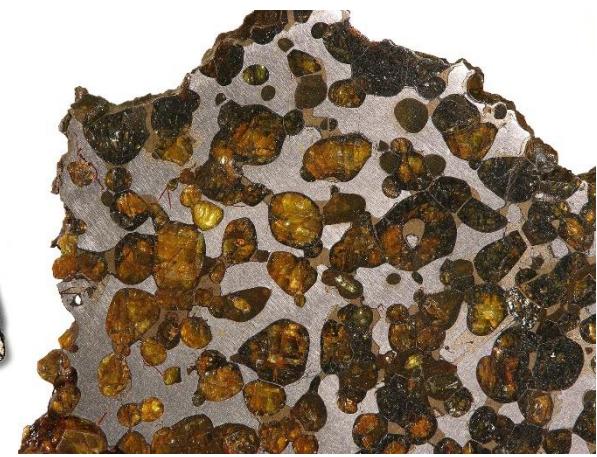




Crust/pre-differentiation
Stony Chondrite
(accreted dust & grains)



Mantle
Stony Achondrite
(crystallised from melt)



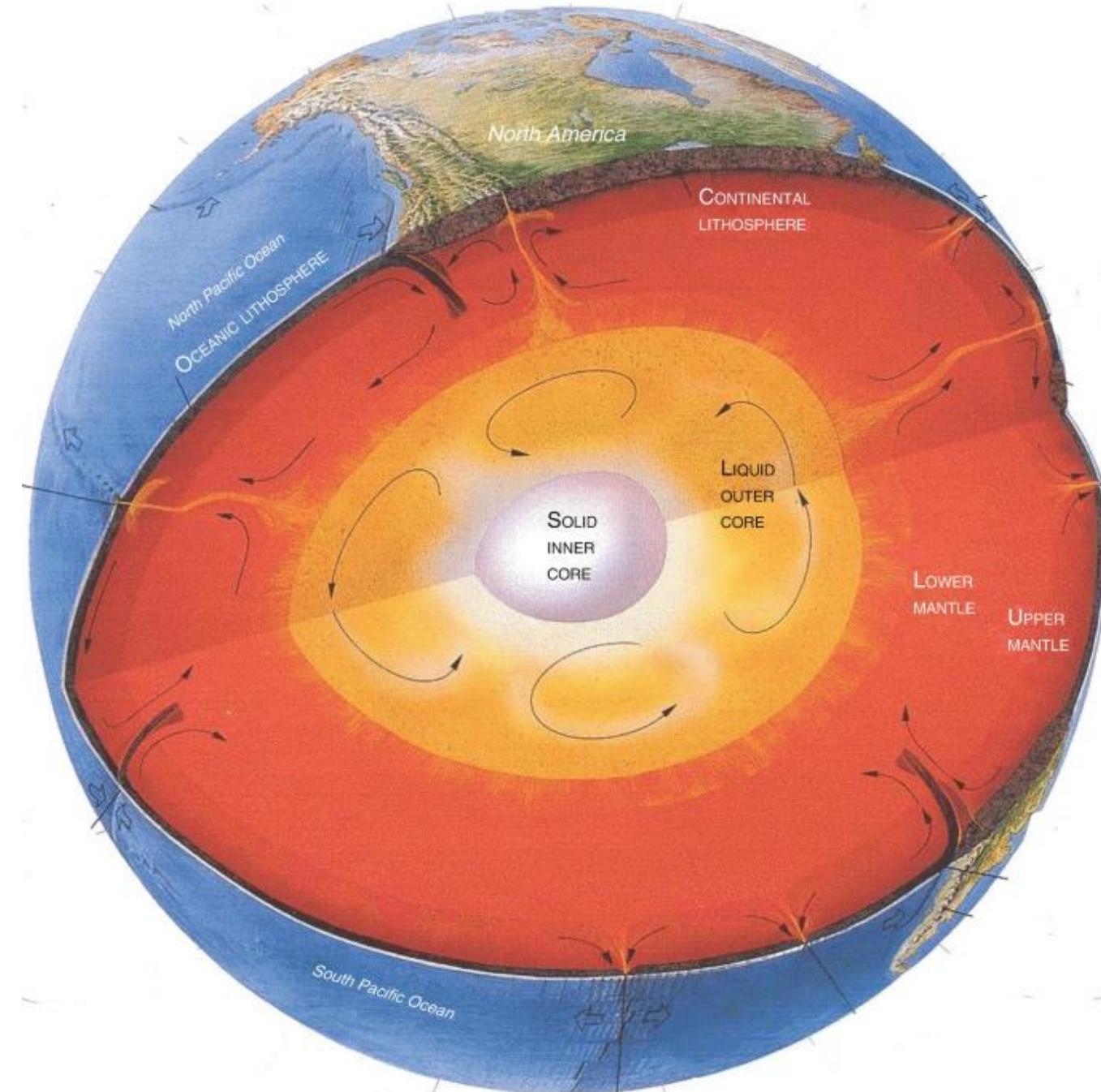
Core-Mantle boundary
Pallasite
(Iron + olivine)

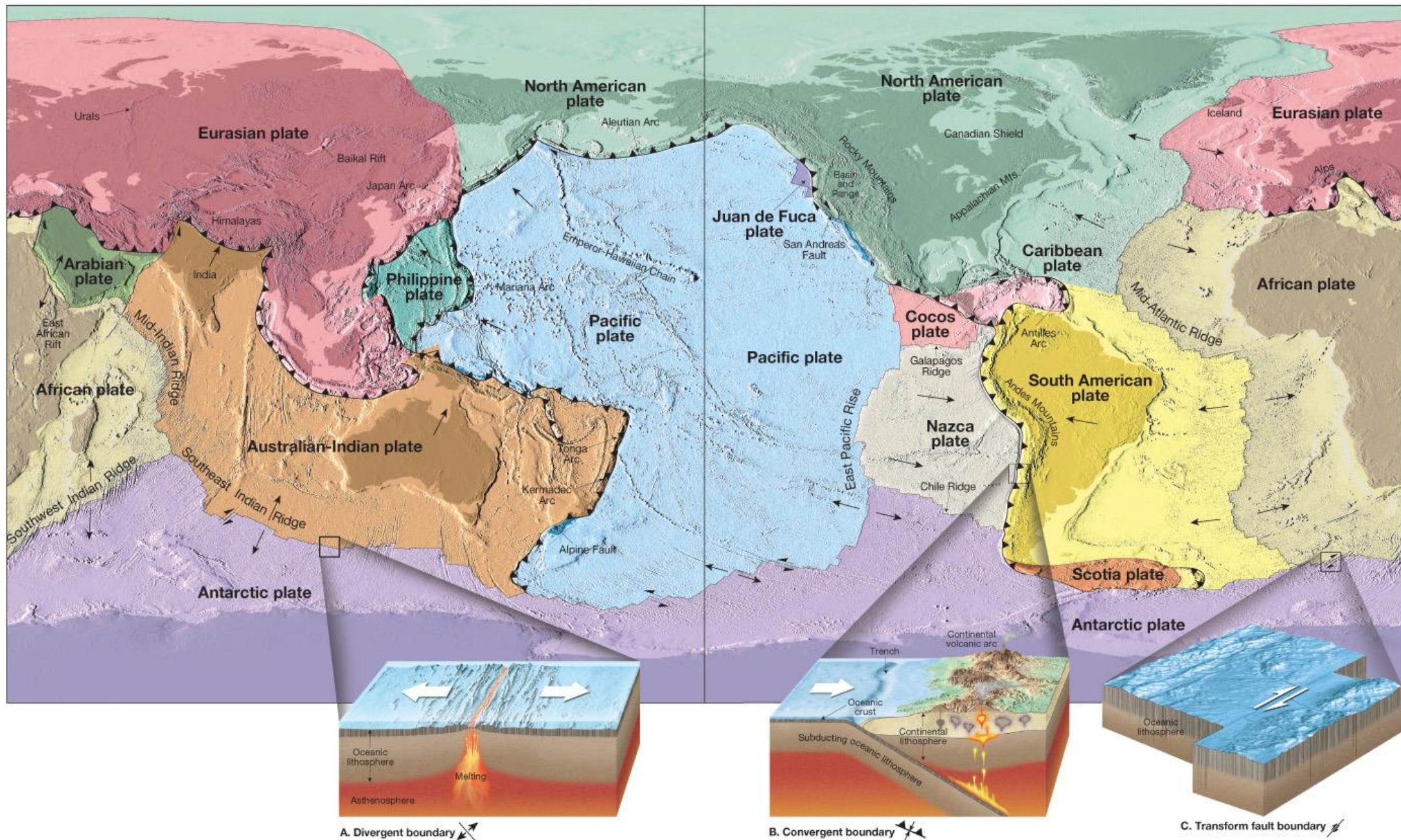


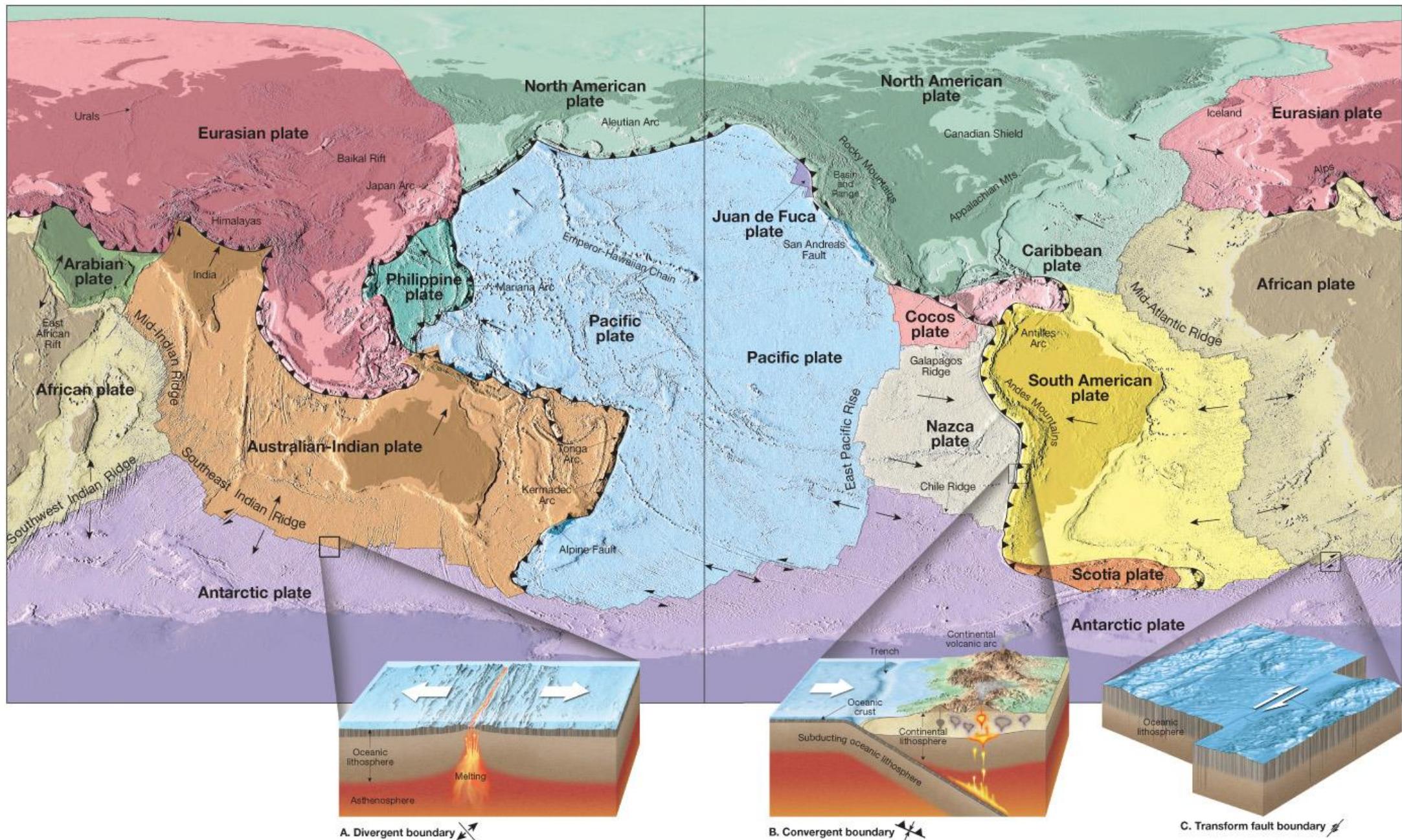
Core
Iron

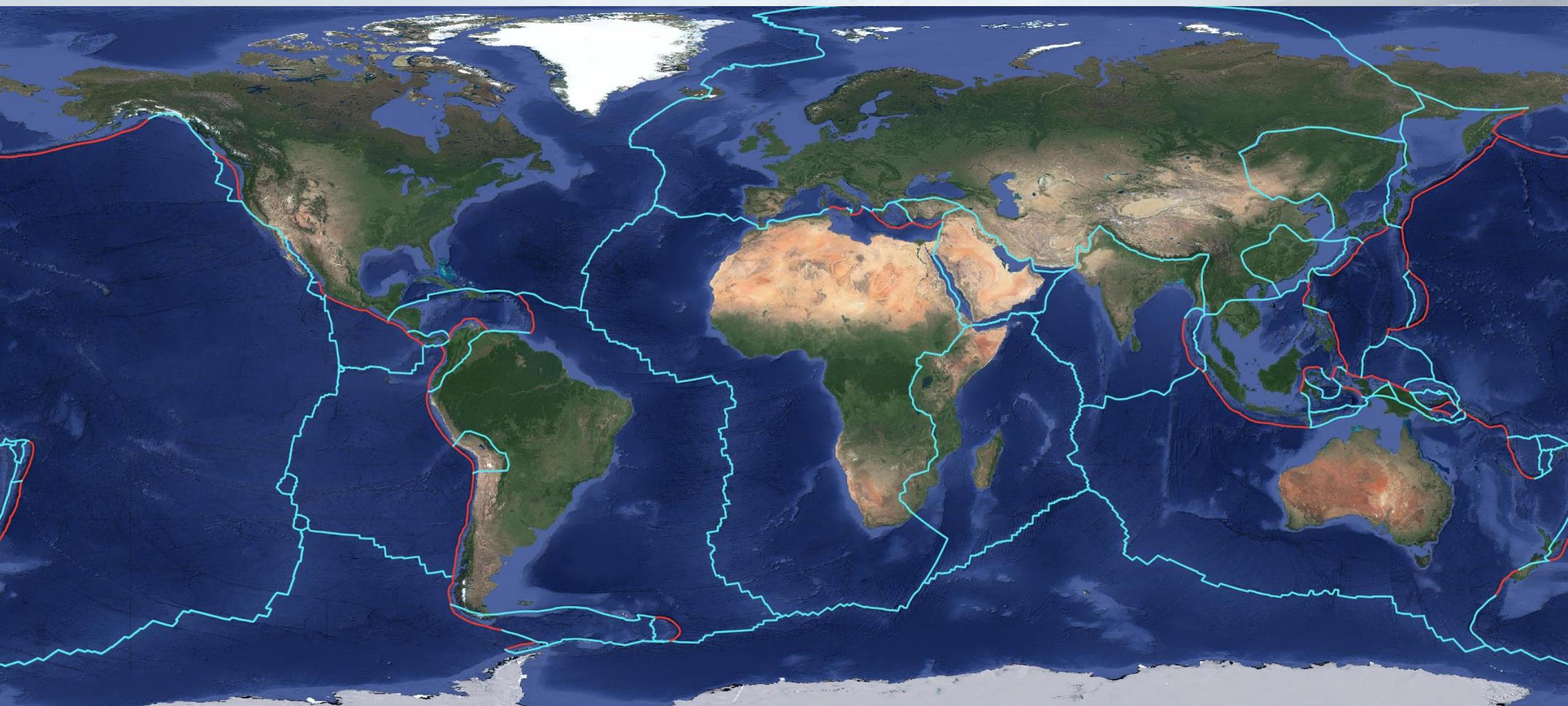


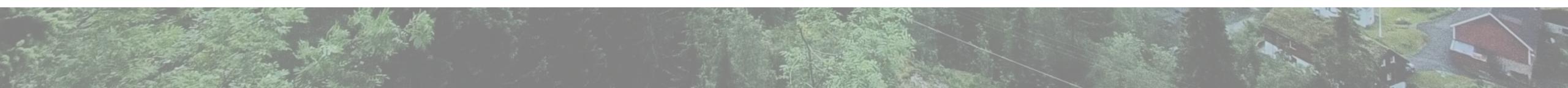
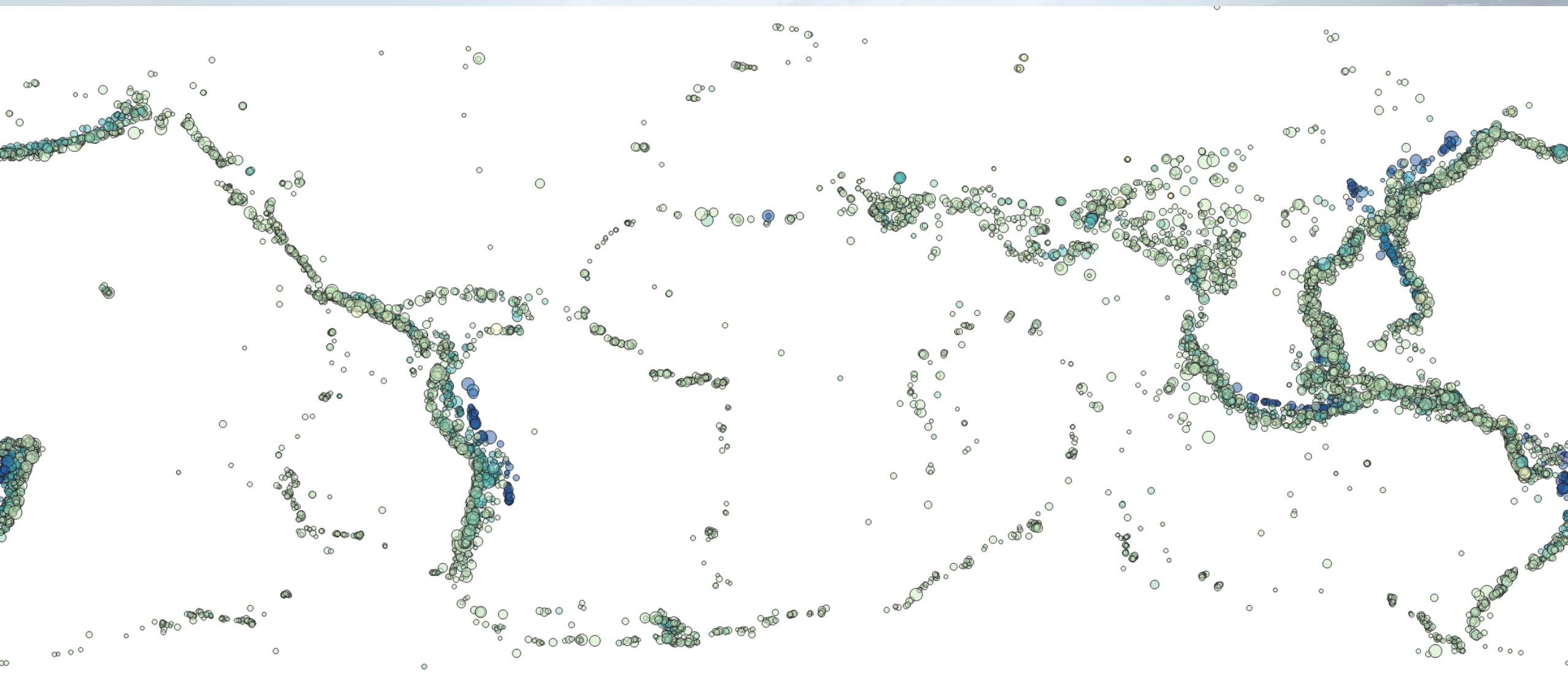


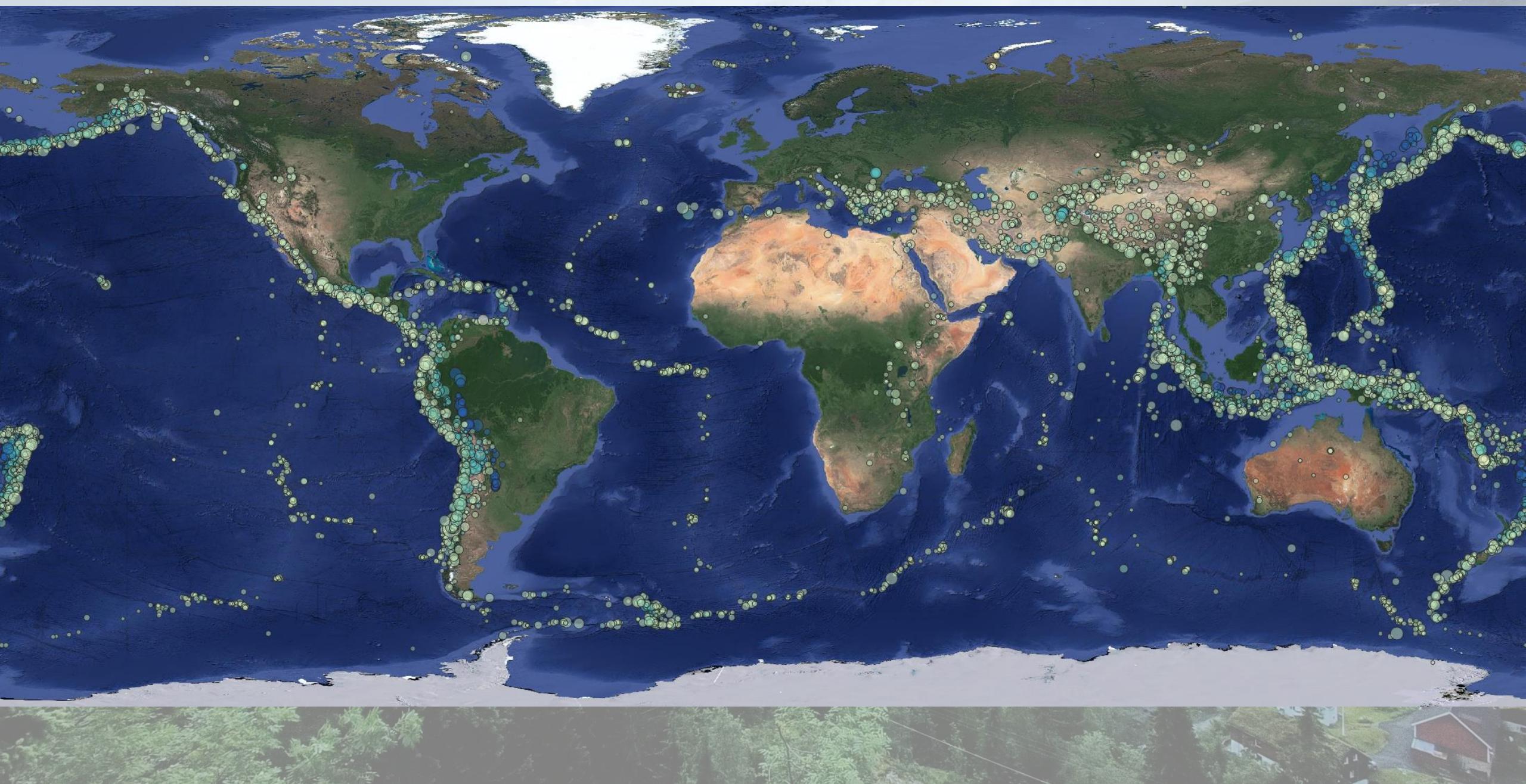


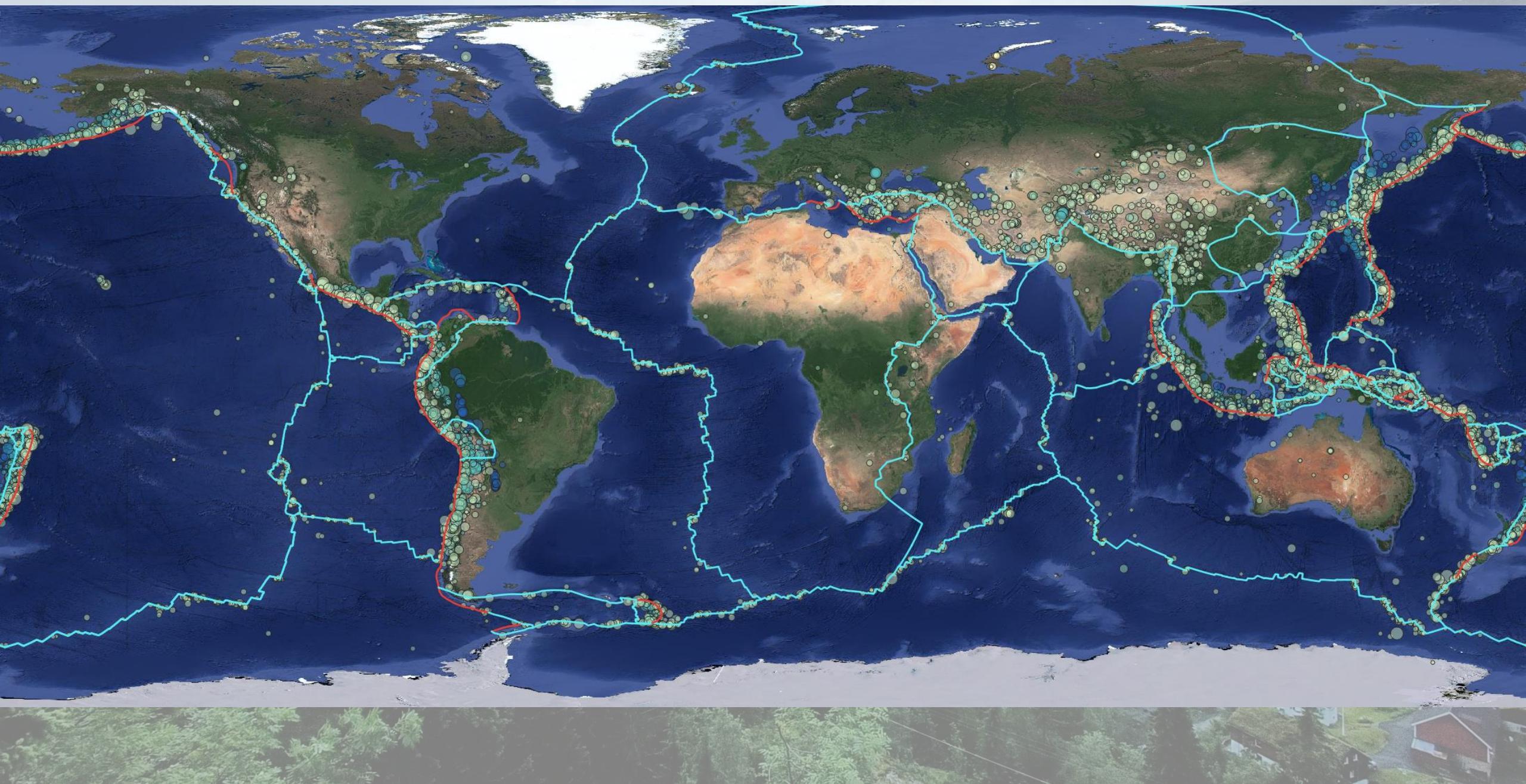


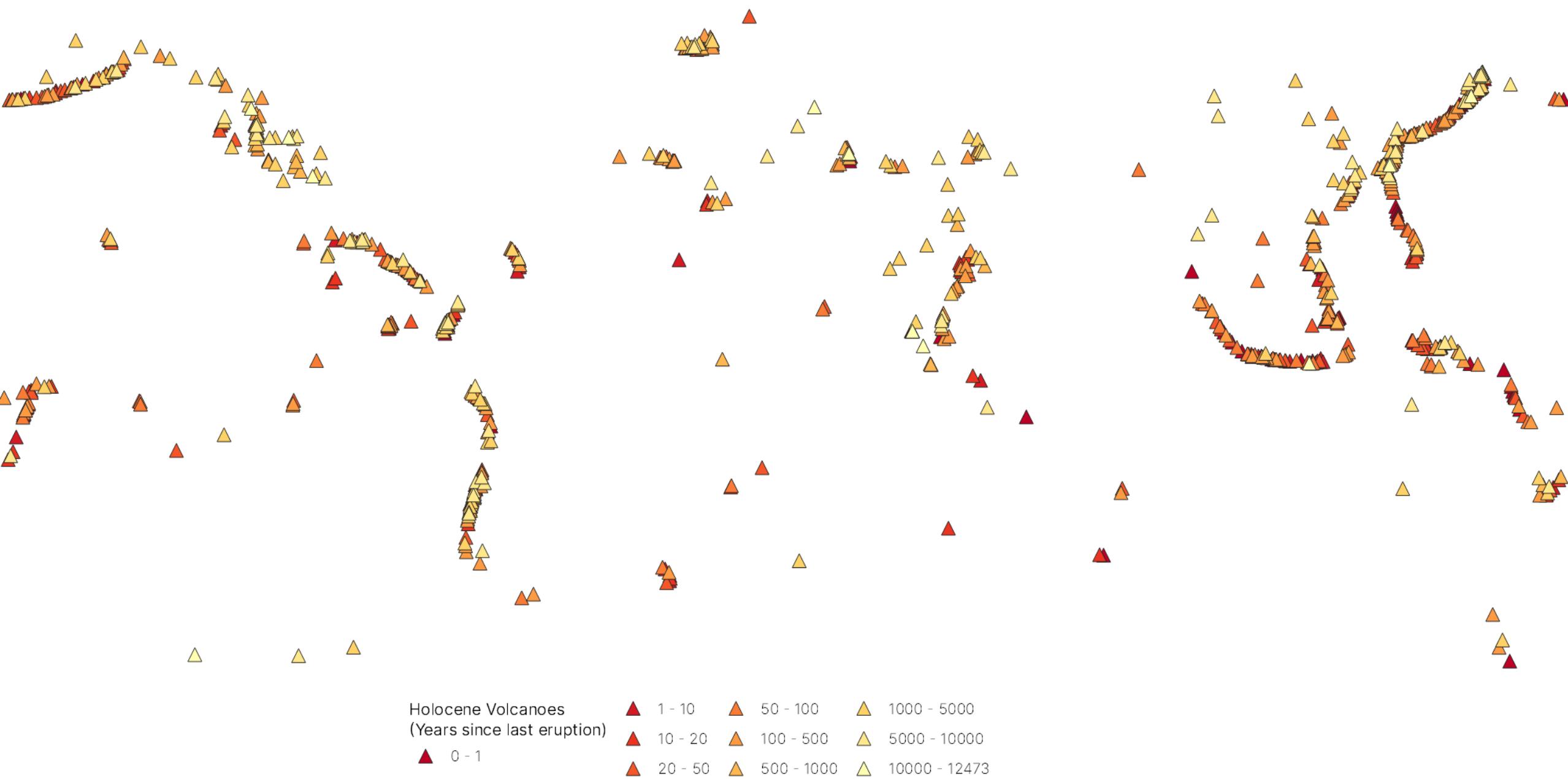


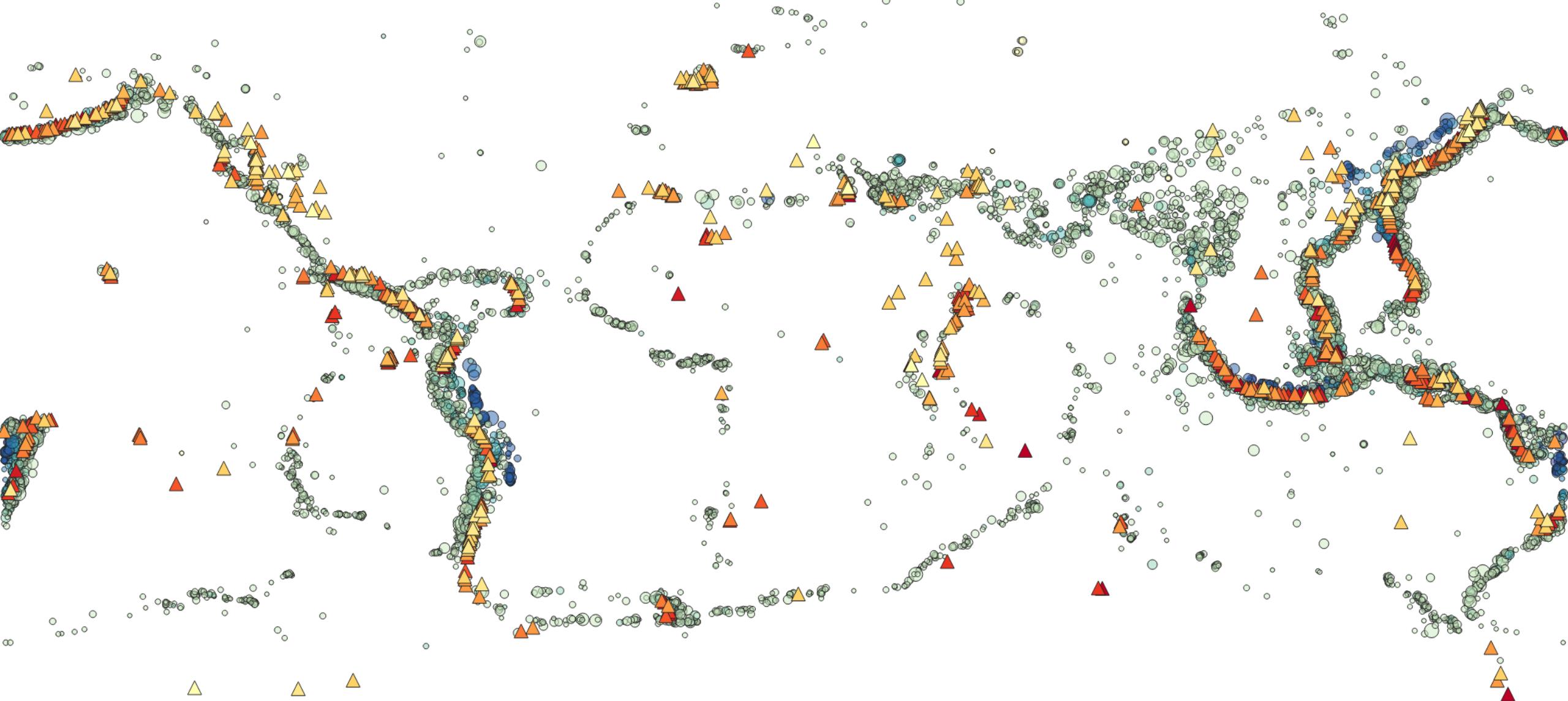












Holocene Volcanoes
(Years since last eruption)

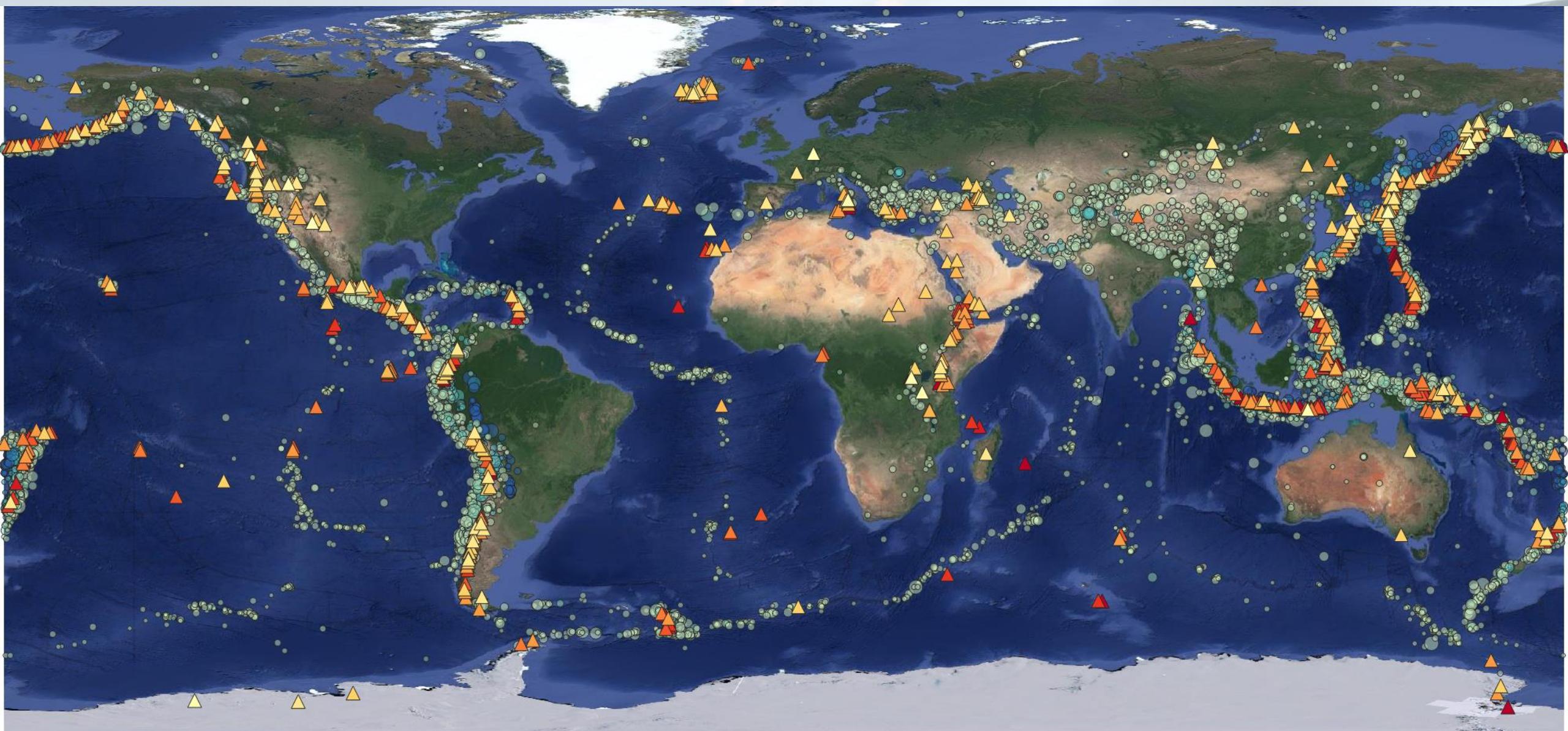
▲ 0 - 1

▲ 1 - 10 ▲ 10 - 20 ▲ 20 - 50 ▲ 50 - 100 ▲ 100 - 500 ▲ 500 - 1000 ▲ 1000 - 5000 ▲ 5000 - 10000 ▲ 10000 - 12473

Earthquakes (by depth)
(size indicates magnitude)

○ -0.097 - 0

○ 0 - 30 ○ 30 - 60 ○ 60 - 250 ○ 250 - 410 ○ 410 - 520 ○ 520 - 660 ○ 660 - 688



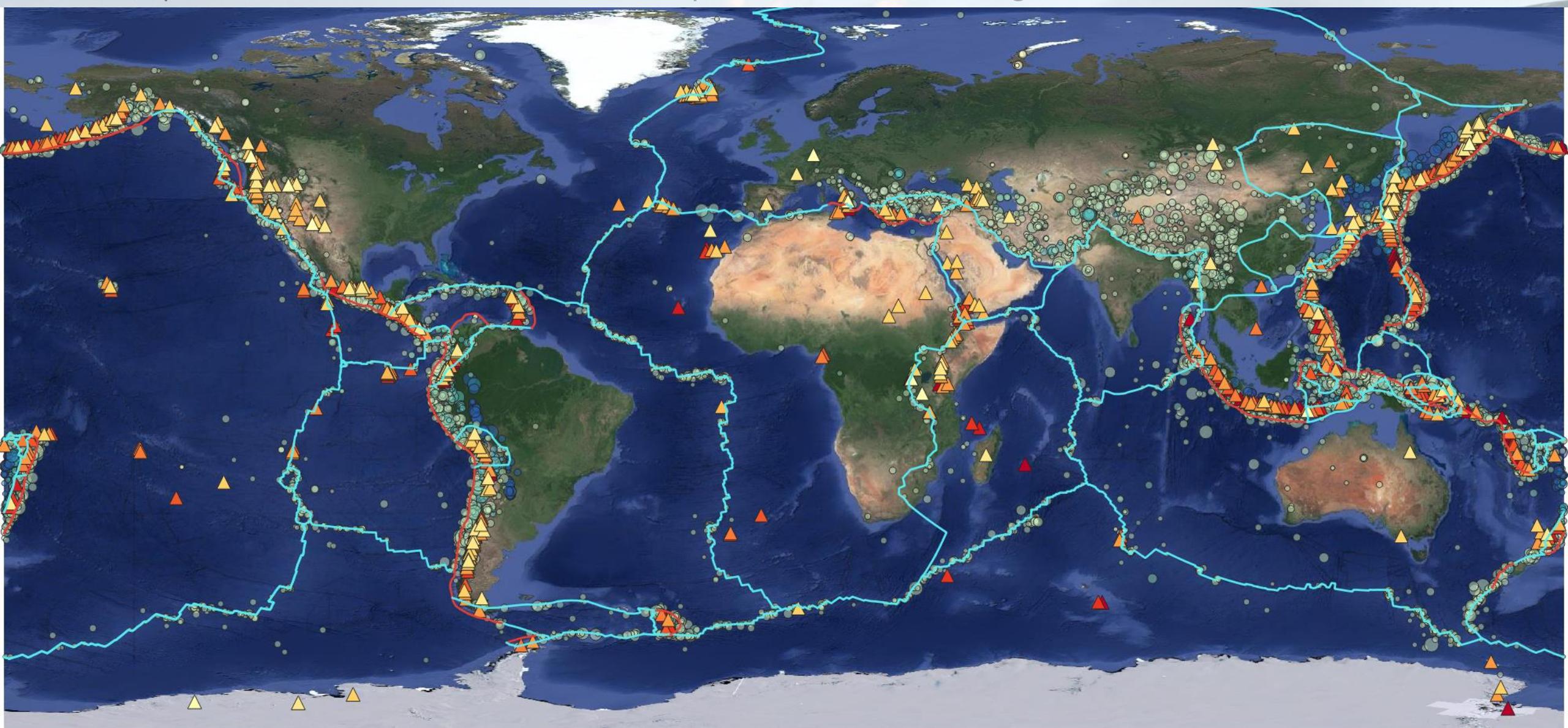
Holocene Volcanoes
(Years since last eruption)

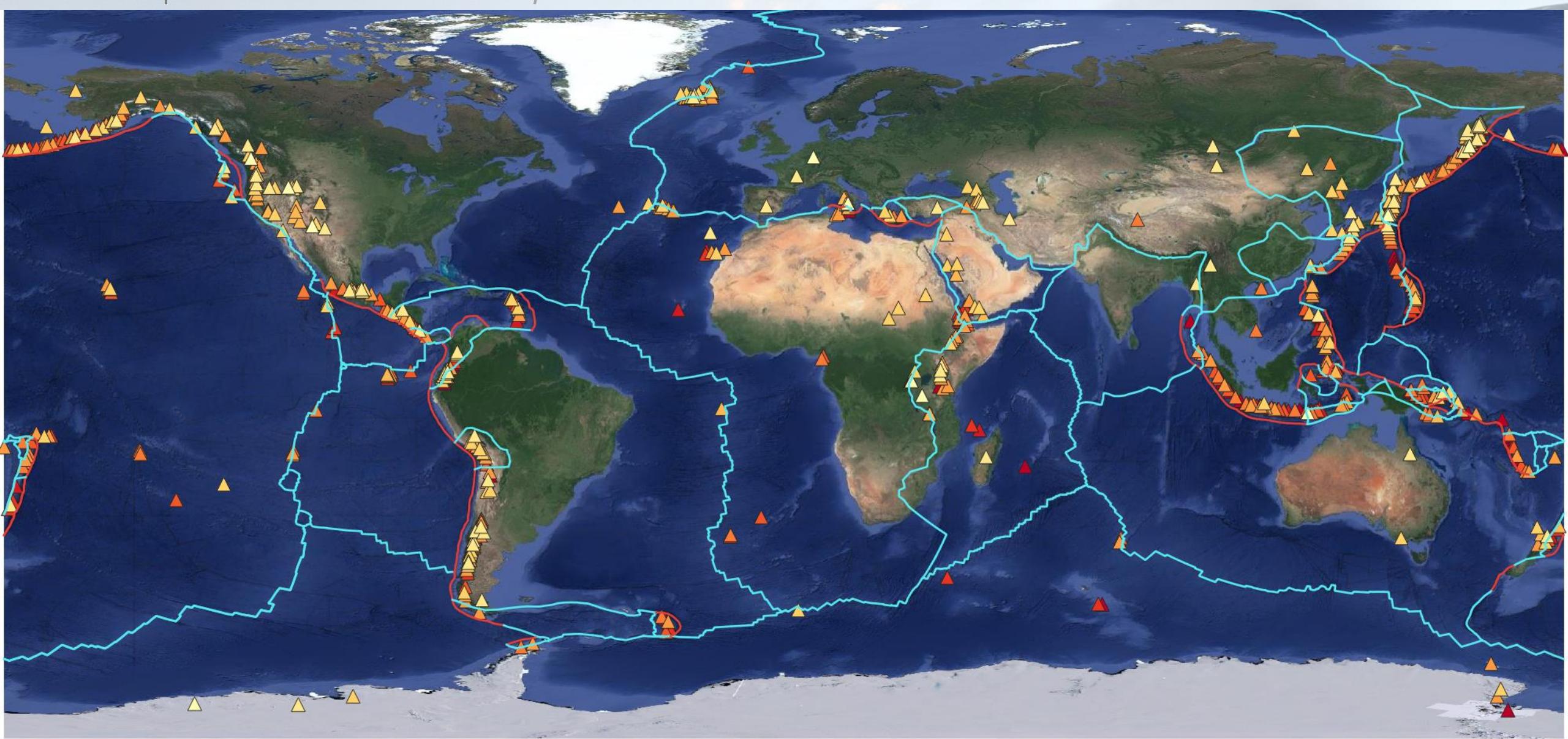
▲ 0 - 1
▲ 1 - 10
▲ 10 - 20
▲ 20 - 50
▲ 50 - 100
▲ 100 - 500
▲ 500 - 1000
▲ 1000 - 5000
▲ 5000 - 10000
▲ 10000 - 12473

▲ 1 - 10
▲ 10 - 20
▲ 20 - 50
▲ 50 - 100
▲ 100 - 500
▲ 500 - 1000
▲ 1000 - 5000
▲ 5000 - 10000
▲ 10000 - 12473

Earthquakes (by depth)
(size indicates magnitude)

○ -0.097 - 0
○ 0 - 30
○ 30 - 60
○ 60 - 250
○ 250 - 410
○ 410 - 520
○ 520 - 660
○ 660 - 688





Tectonic Plate boundaries

Subduction Zone

Constructive or Conservative

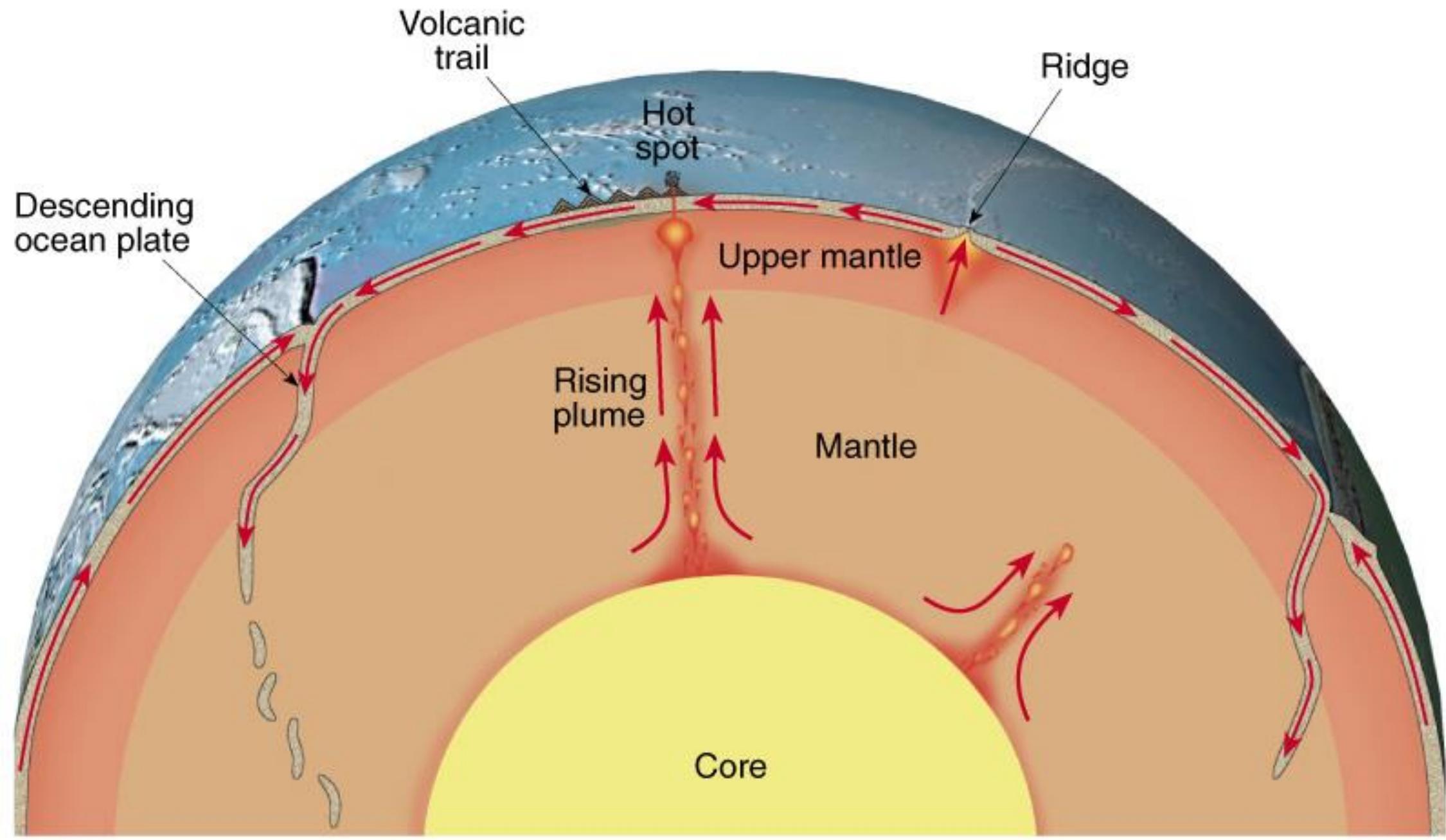
Holocene Volcanoes
(Years since last eruption)

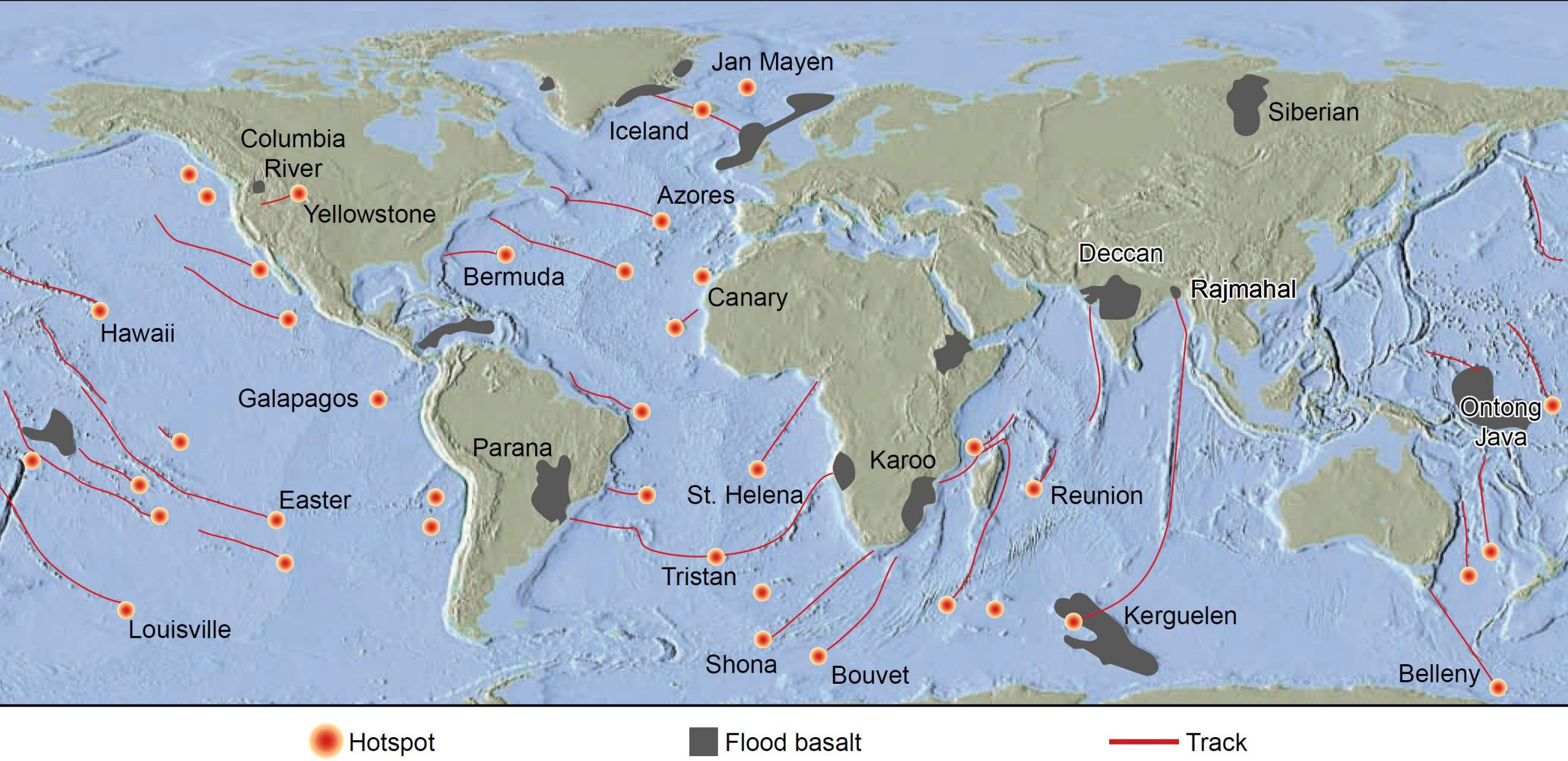
0 - 1

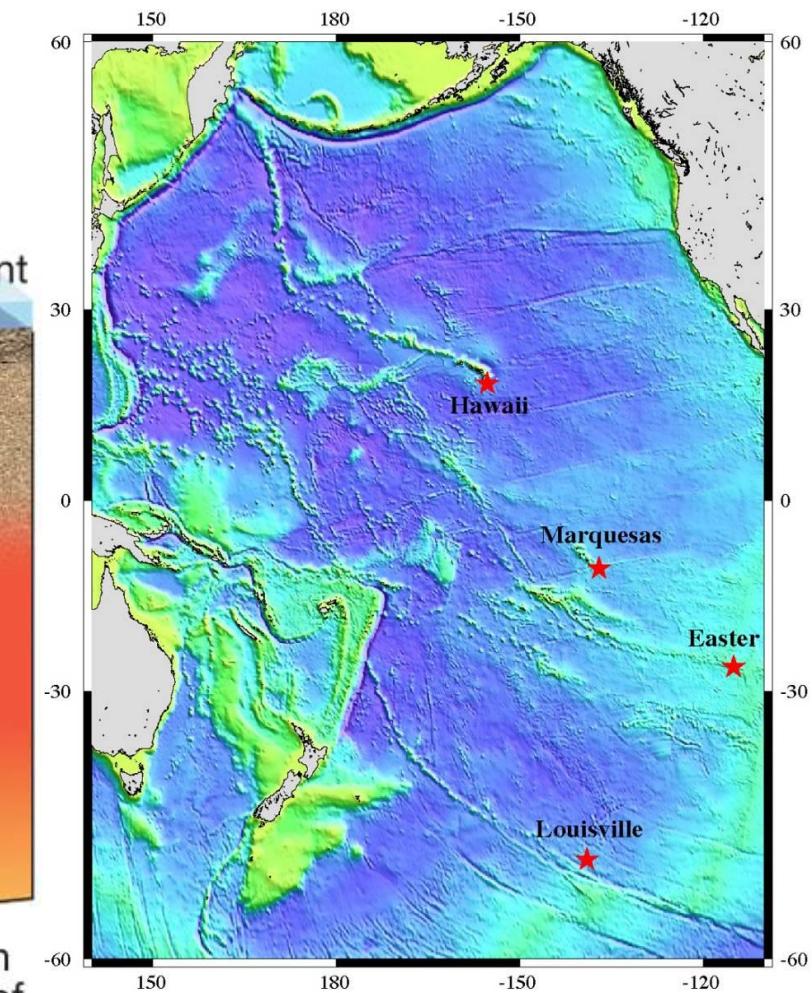
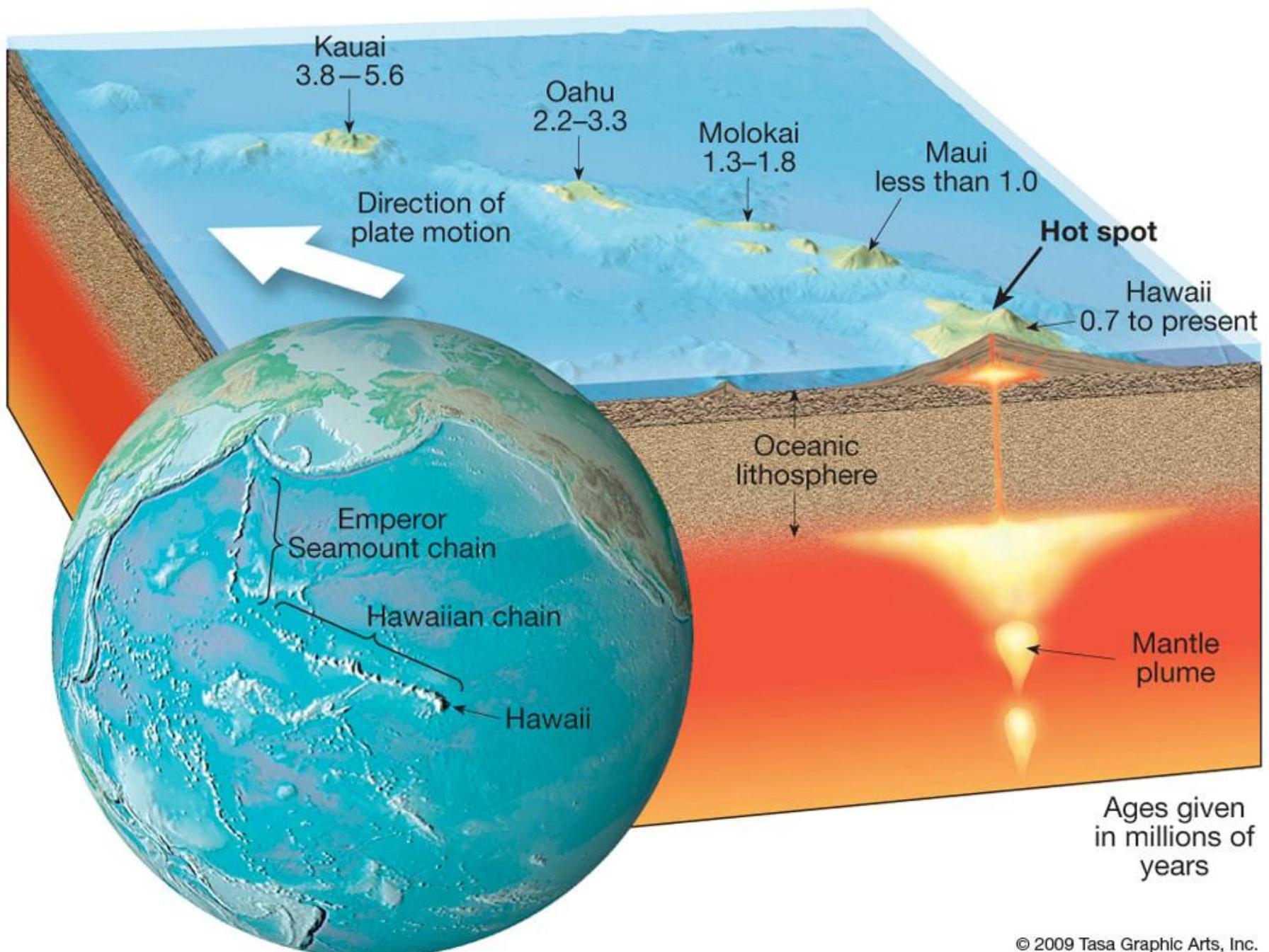
1 - 10 50 - 100 1000 - 5000

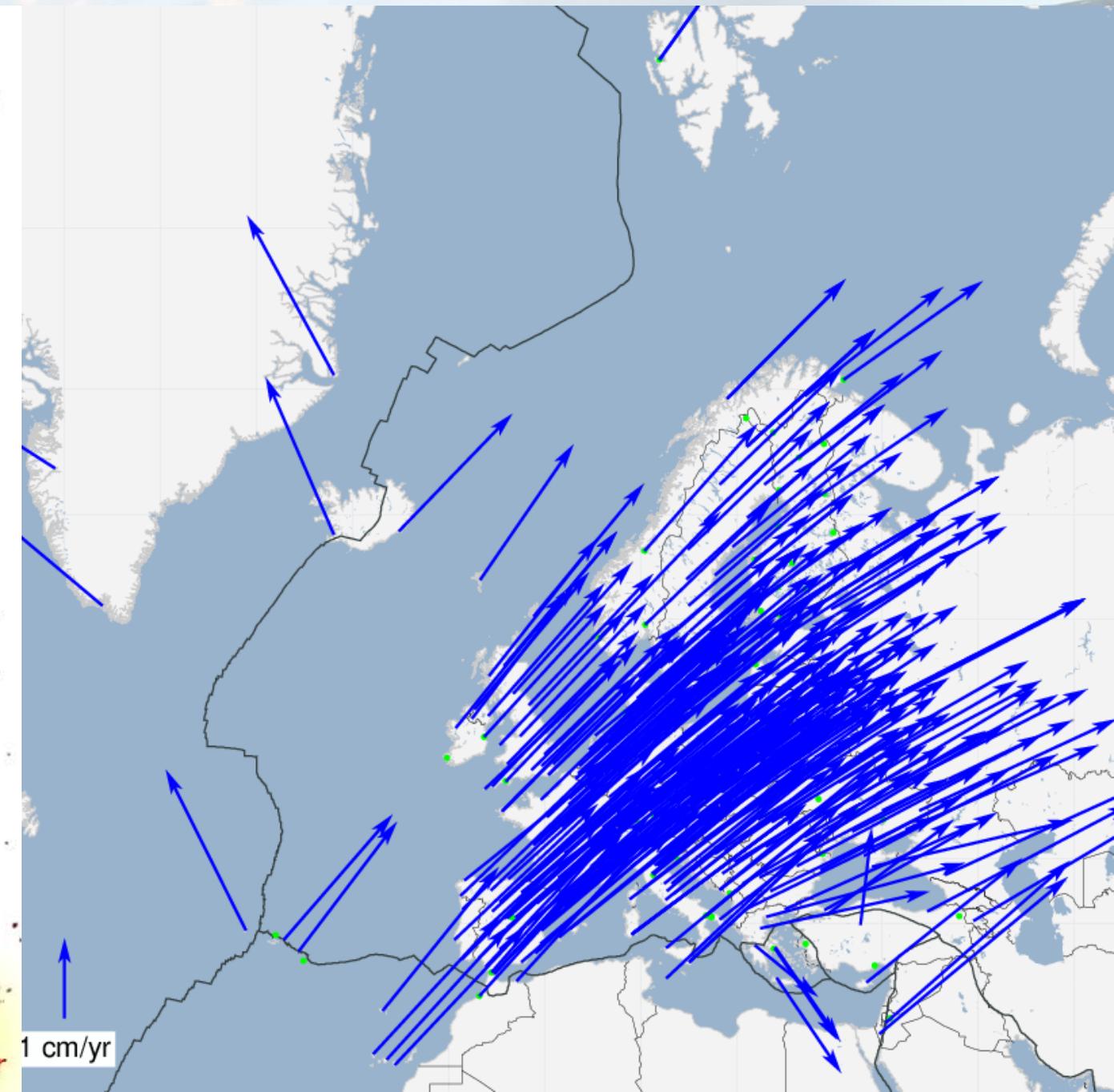
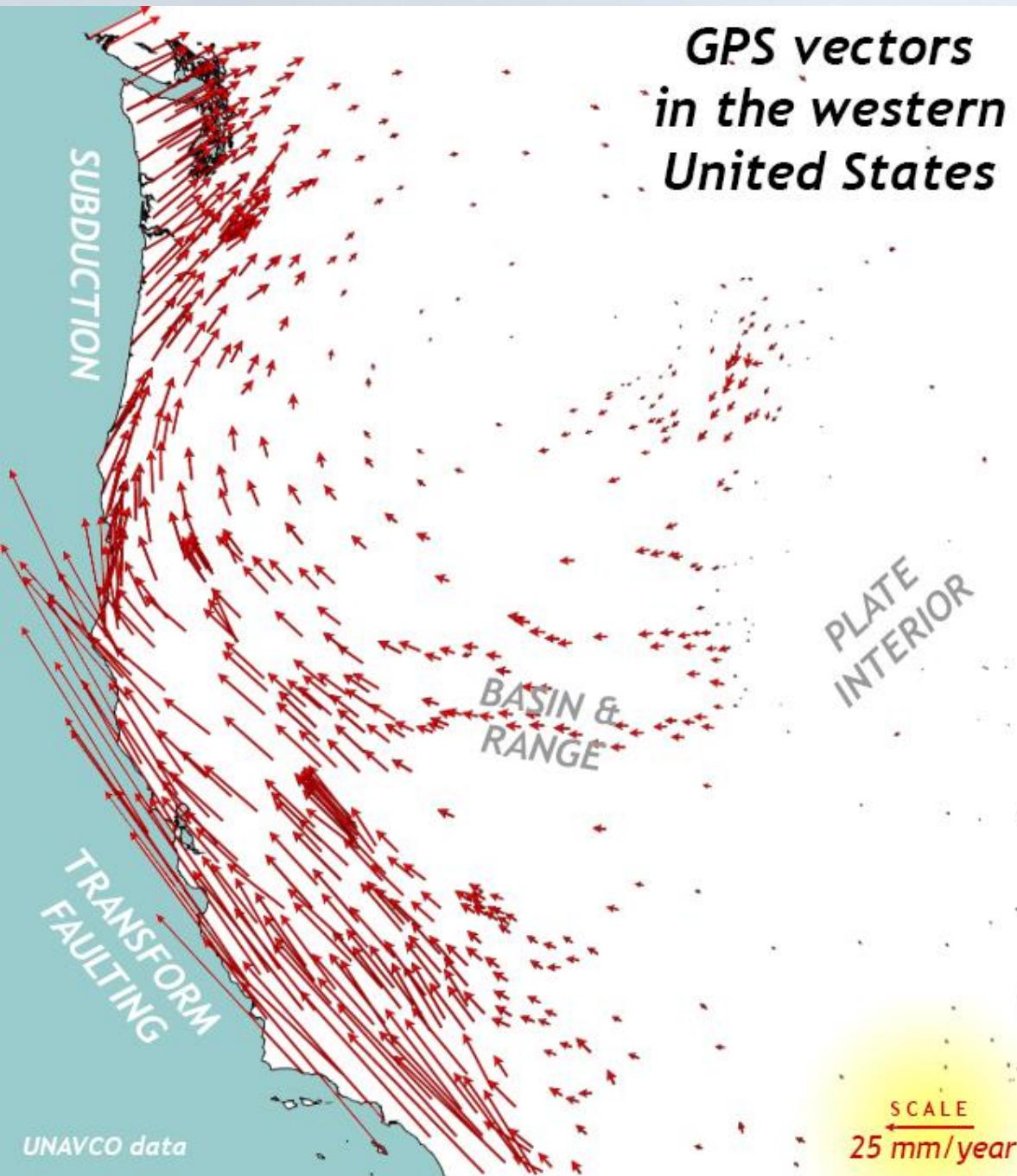
10 - 20 100 - 500 5000 - 10000

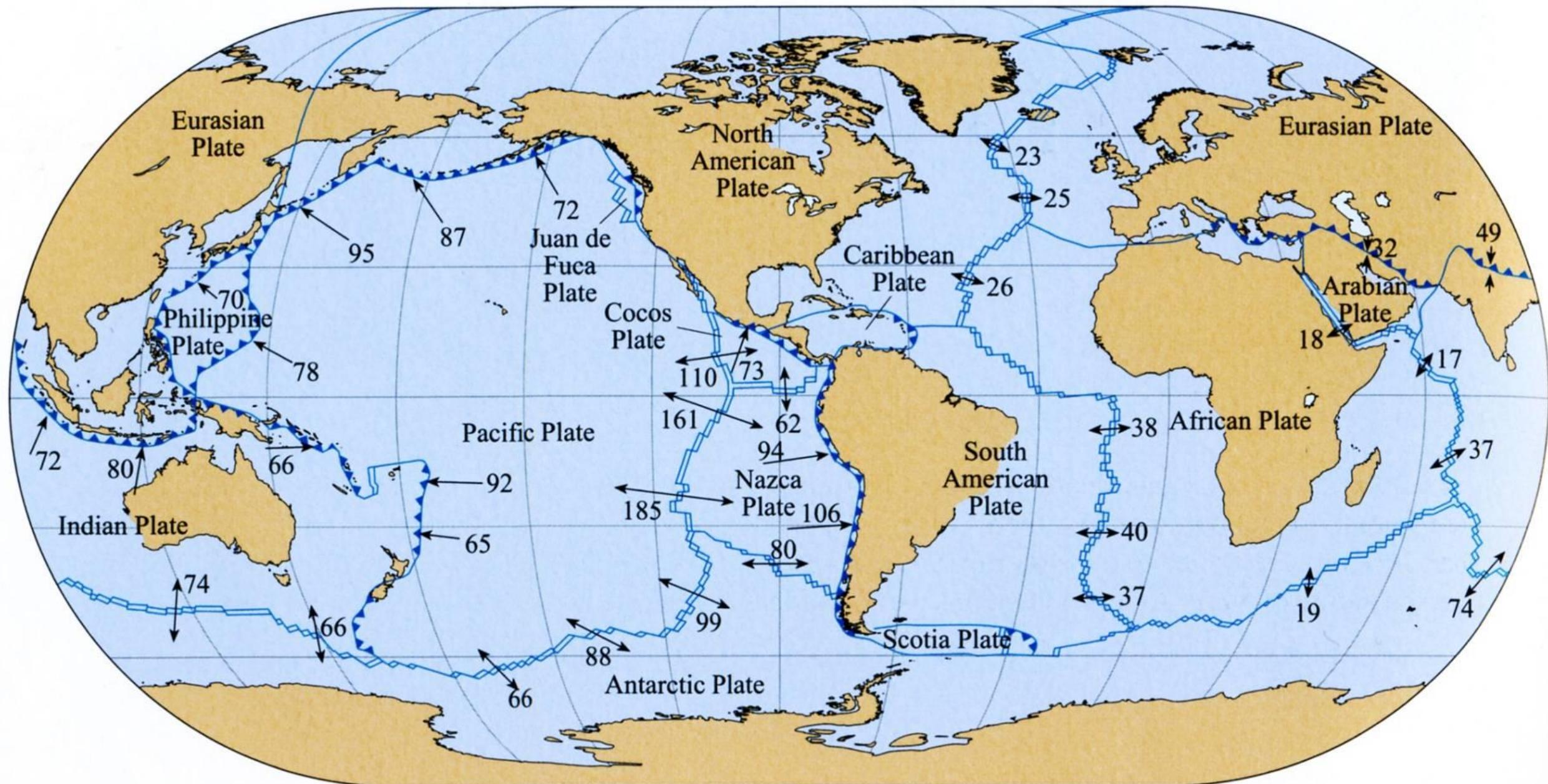
20 - 50 500 - 1000 10000 - 12473

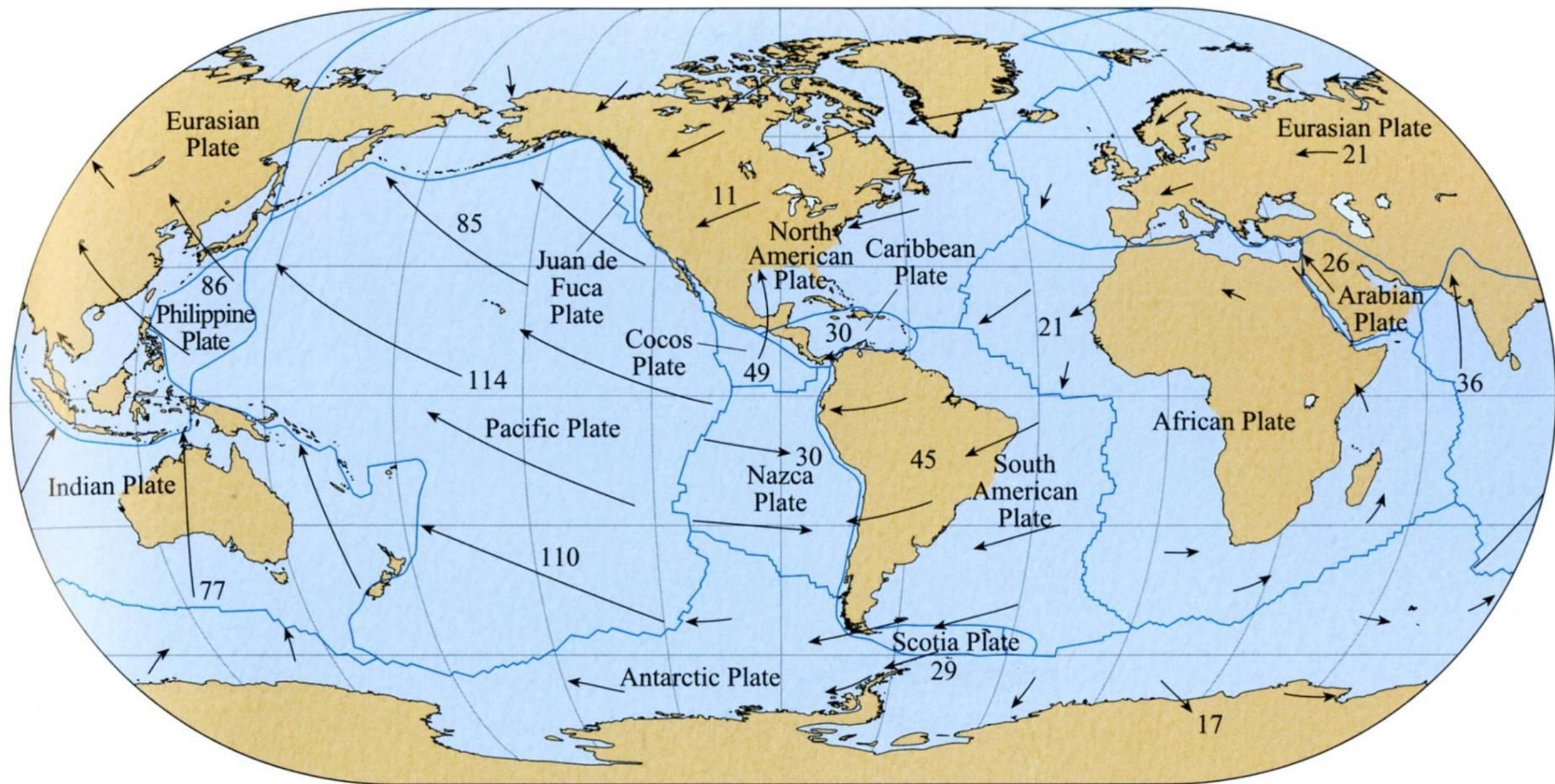


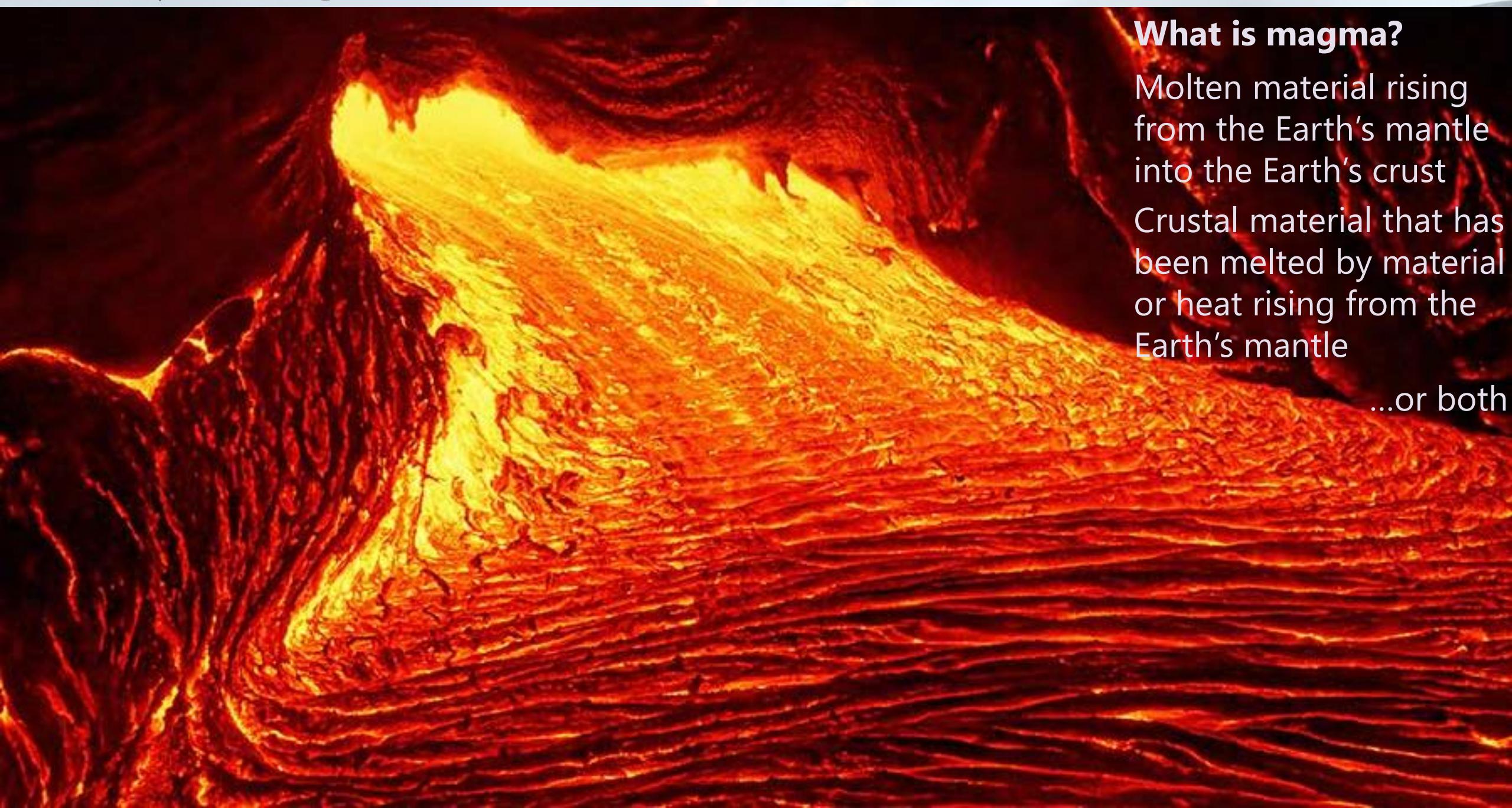












What is magma?

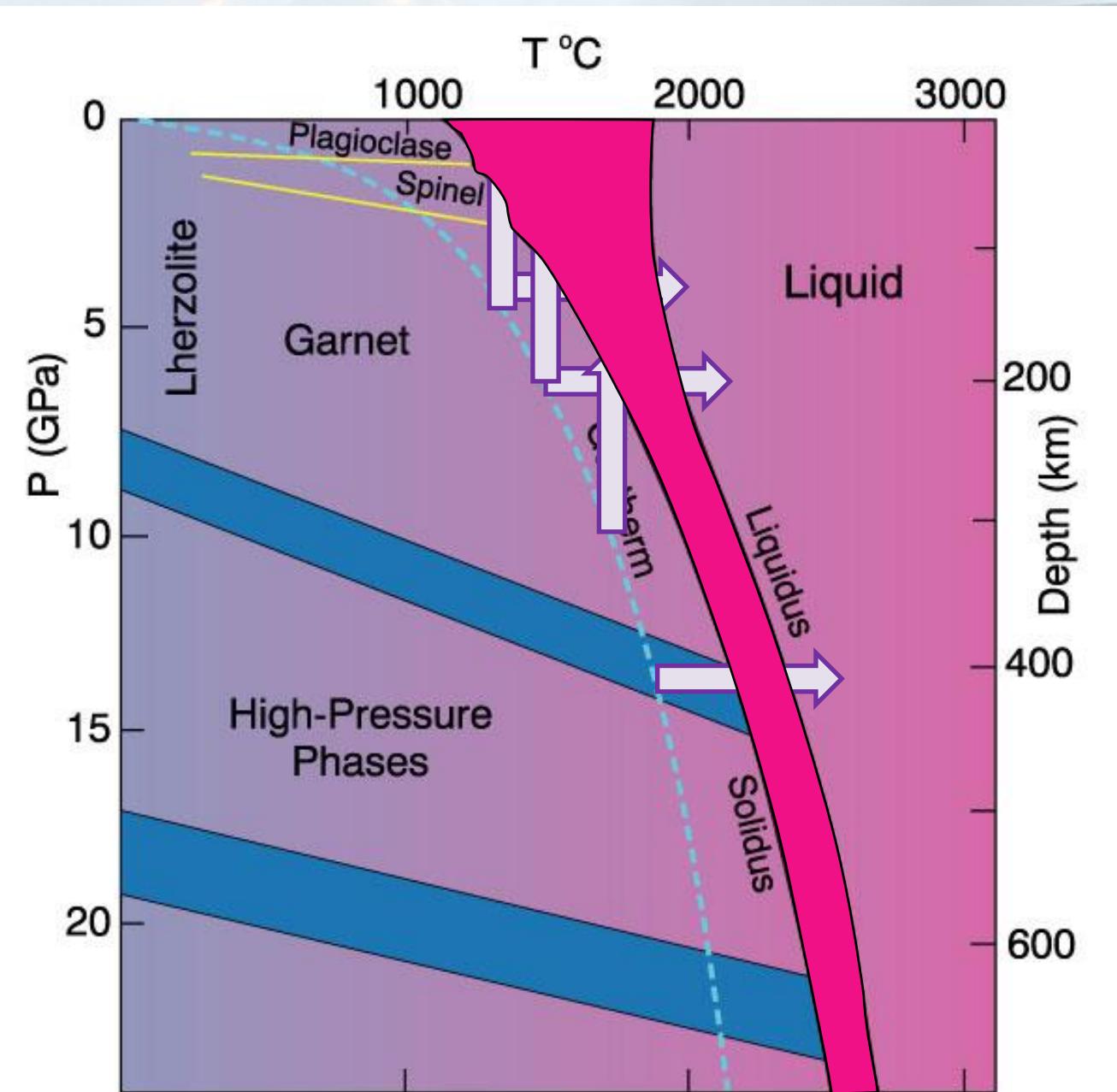
Molten material rising from the Earth's mantle into the Earth's crust

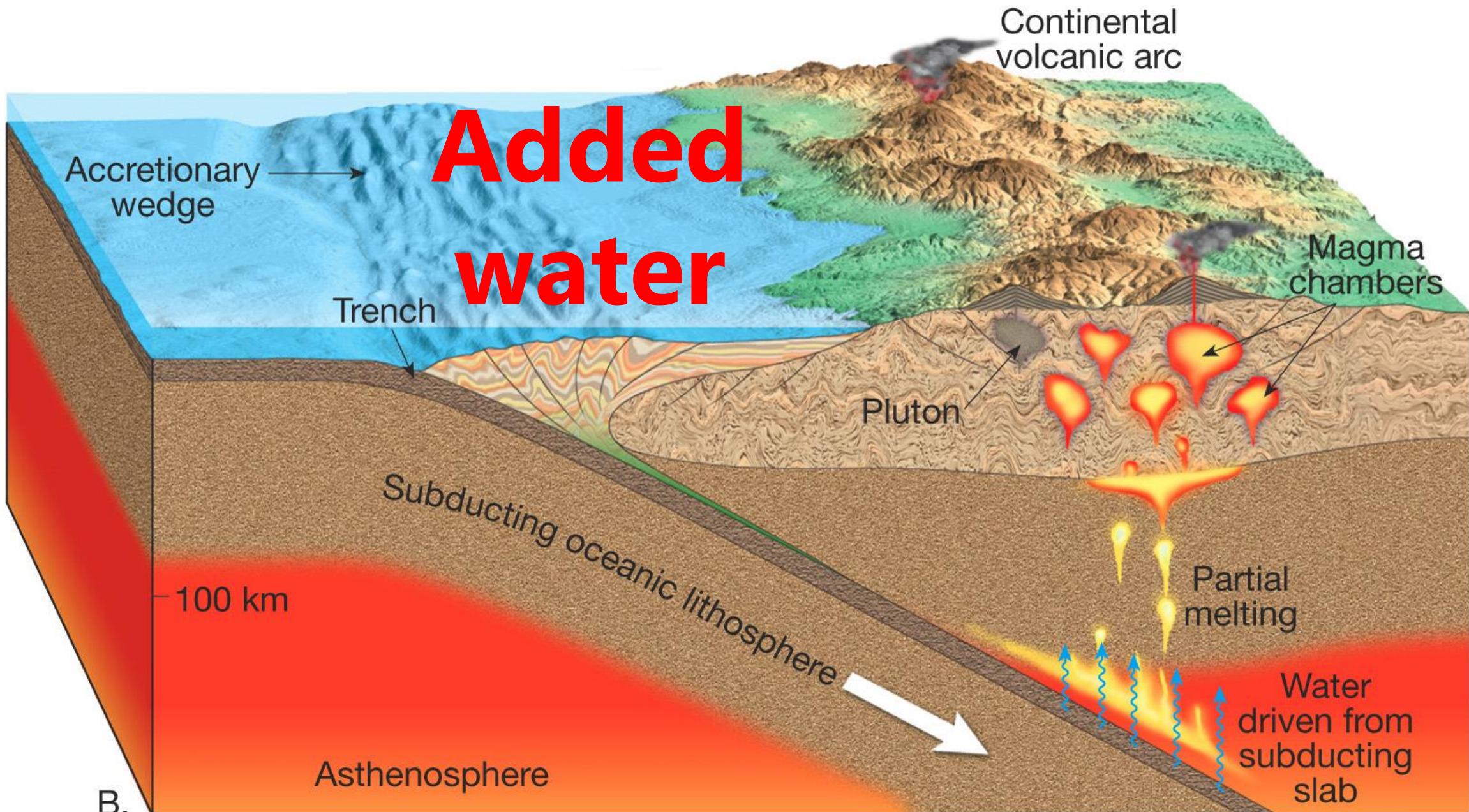
Crustal material that has been melted by material or heat rising from the Earth's mantle

...or both

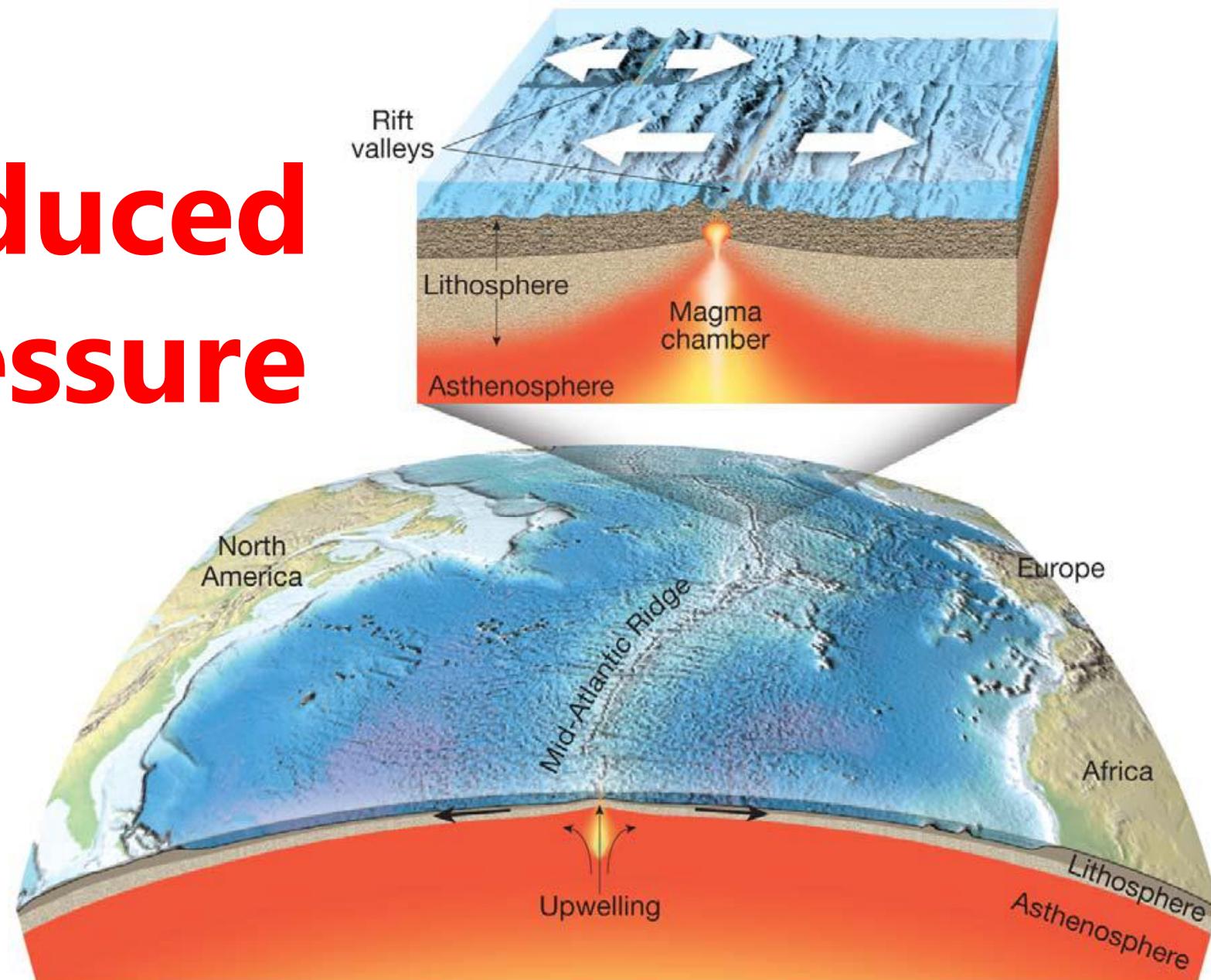
Three ways:

- Increase the temperature
- Lower the pressure
- Add water

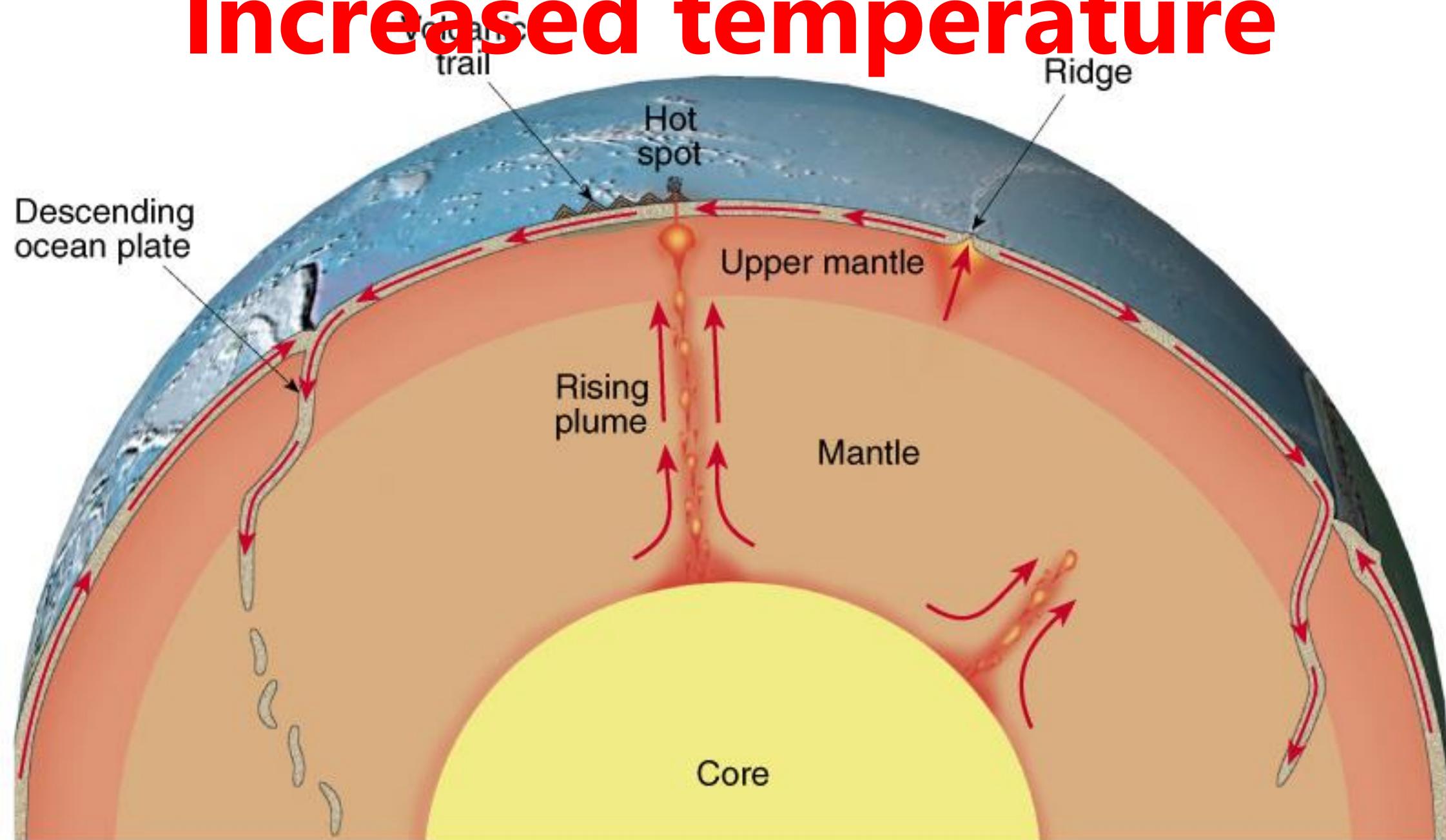


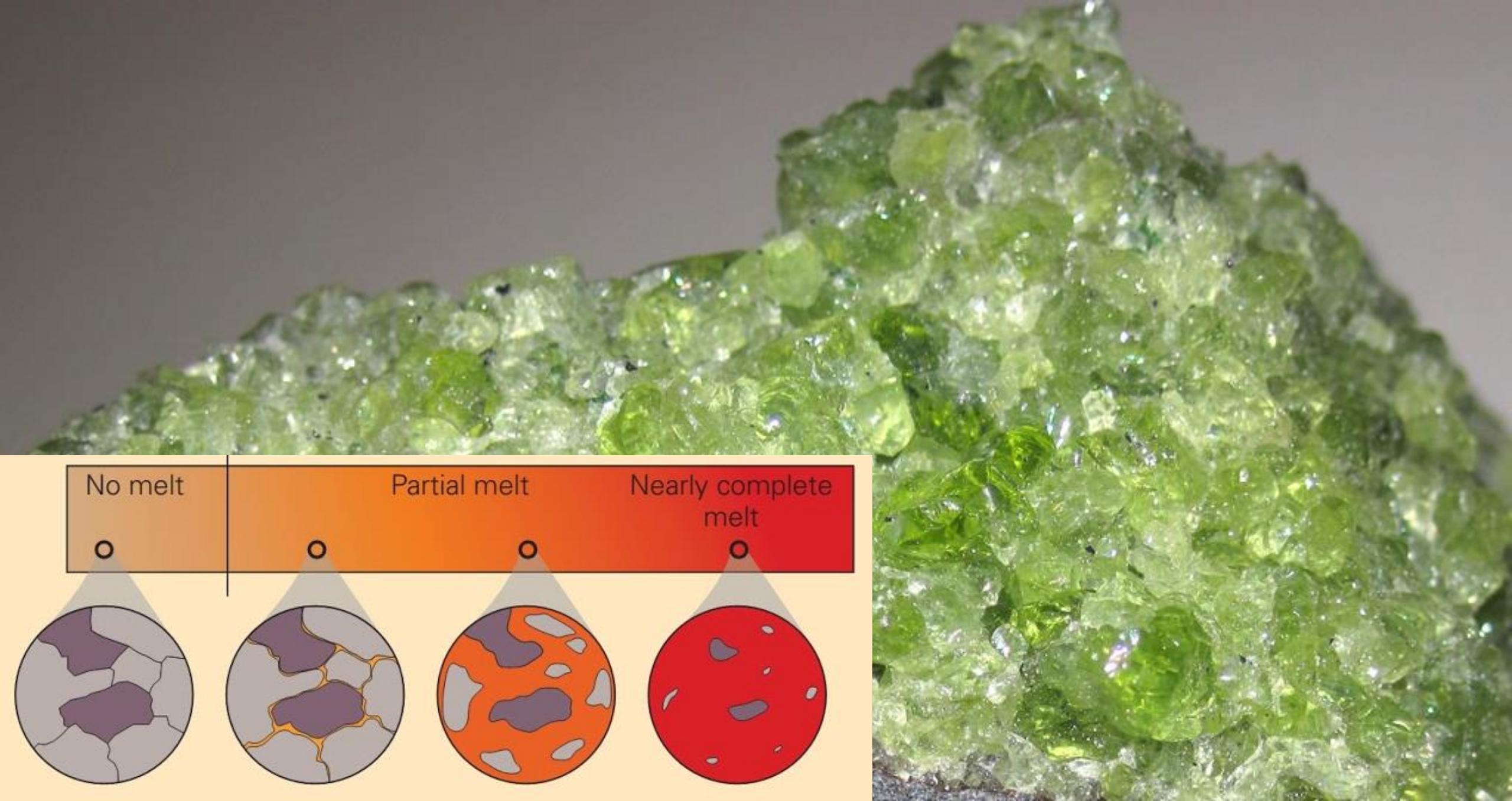


Reduced pressure



Increased temperature

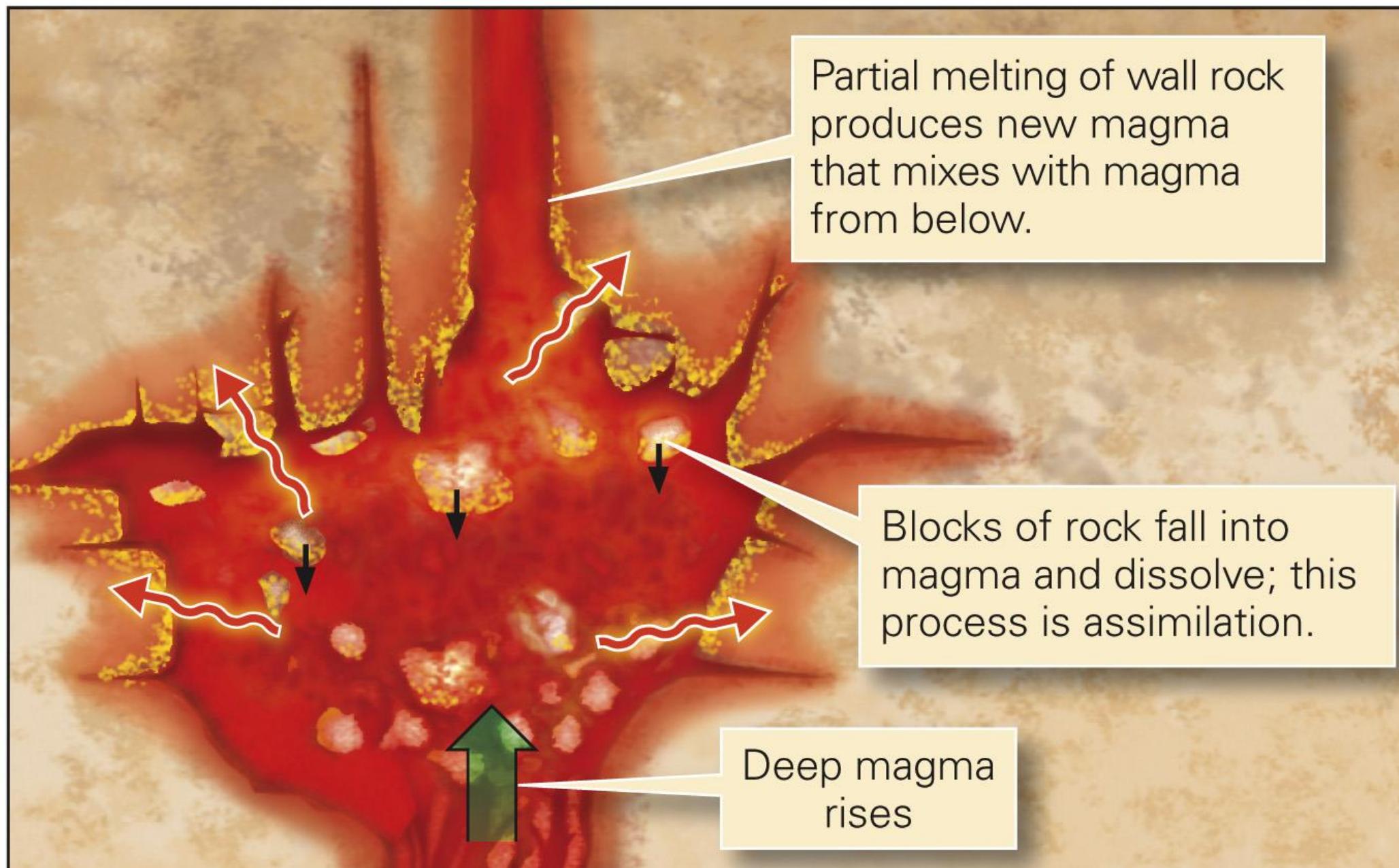


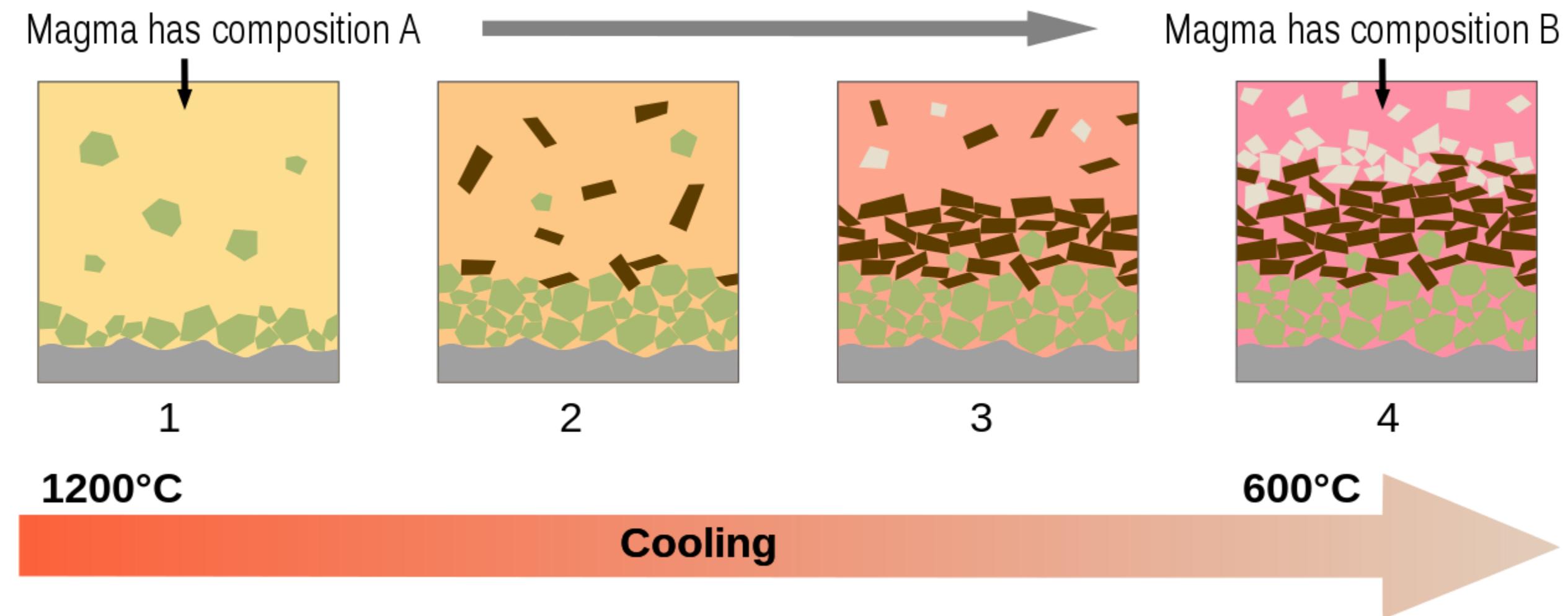


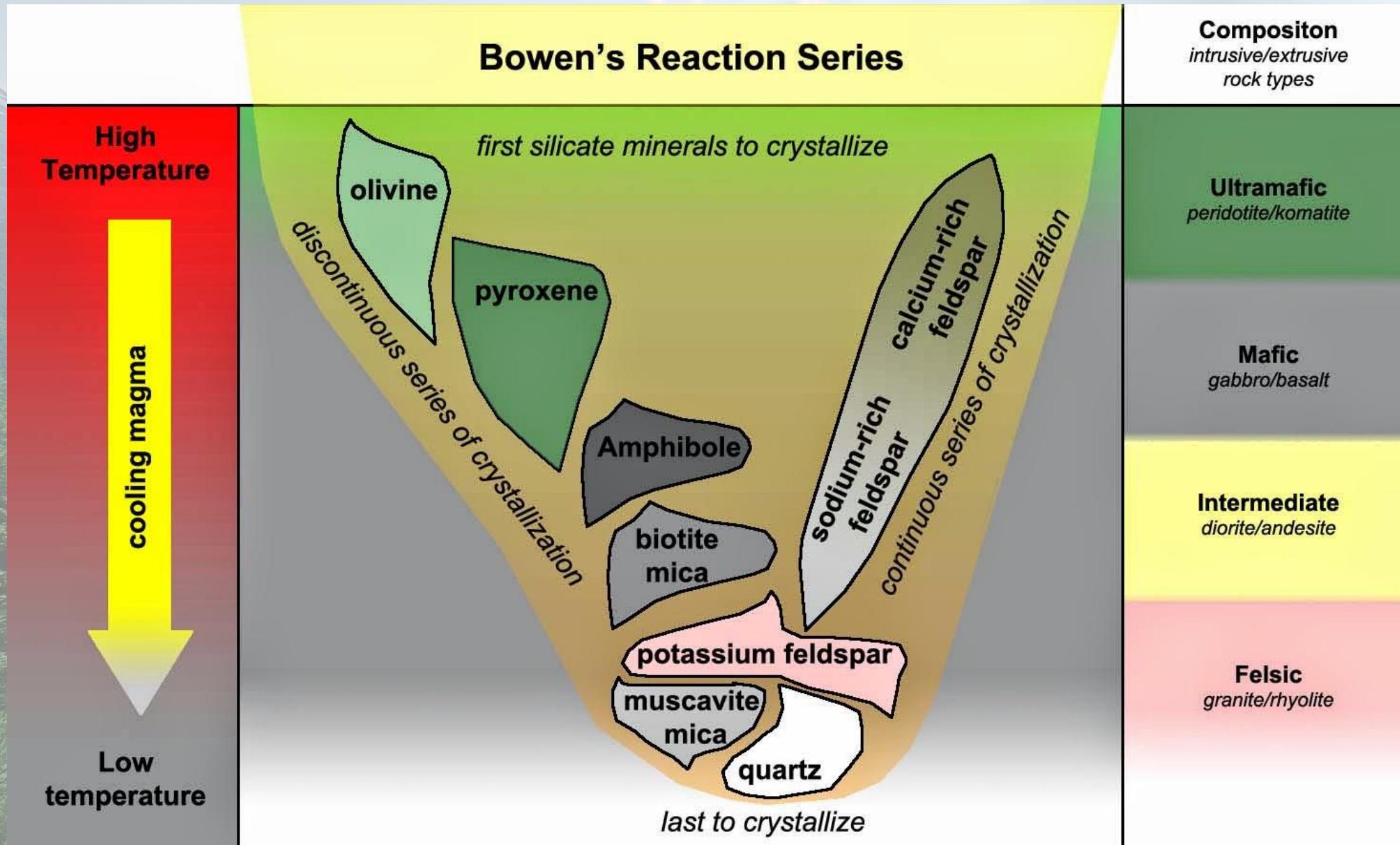


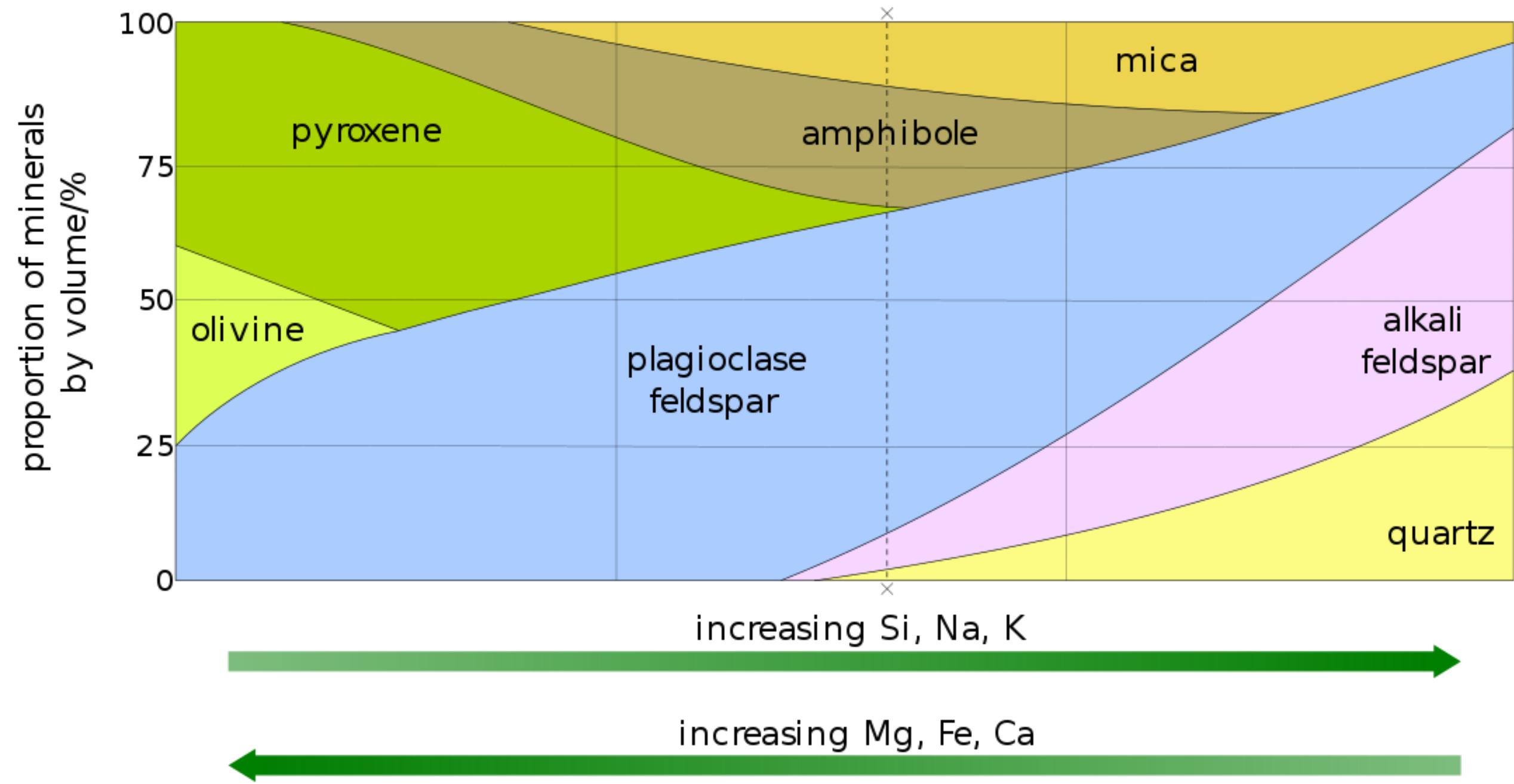
A cartoon character with a large, bulbous nose, wearing round green-tinted glasses and a white lab coat over a green shirt, is shouting with a distressed expression. He is positioned in front of a dark, jagged rock wall with orange lava flowing down it. A speech bubble originates from his mouth, containing the text:

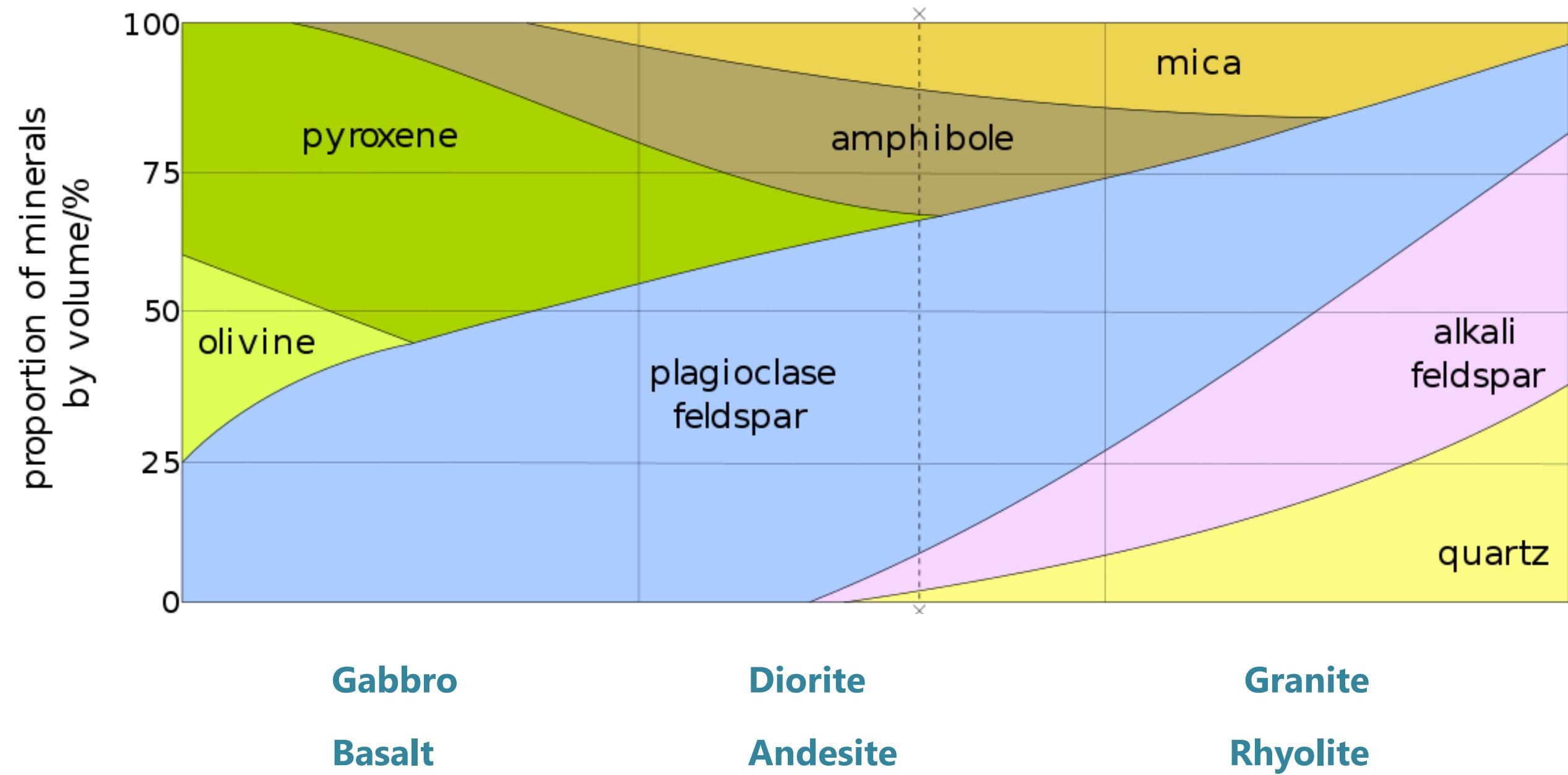
PROFESSOR!
LAVA!
HOT!

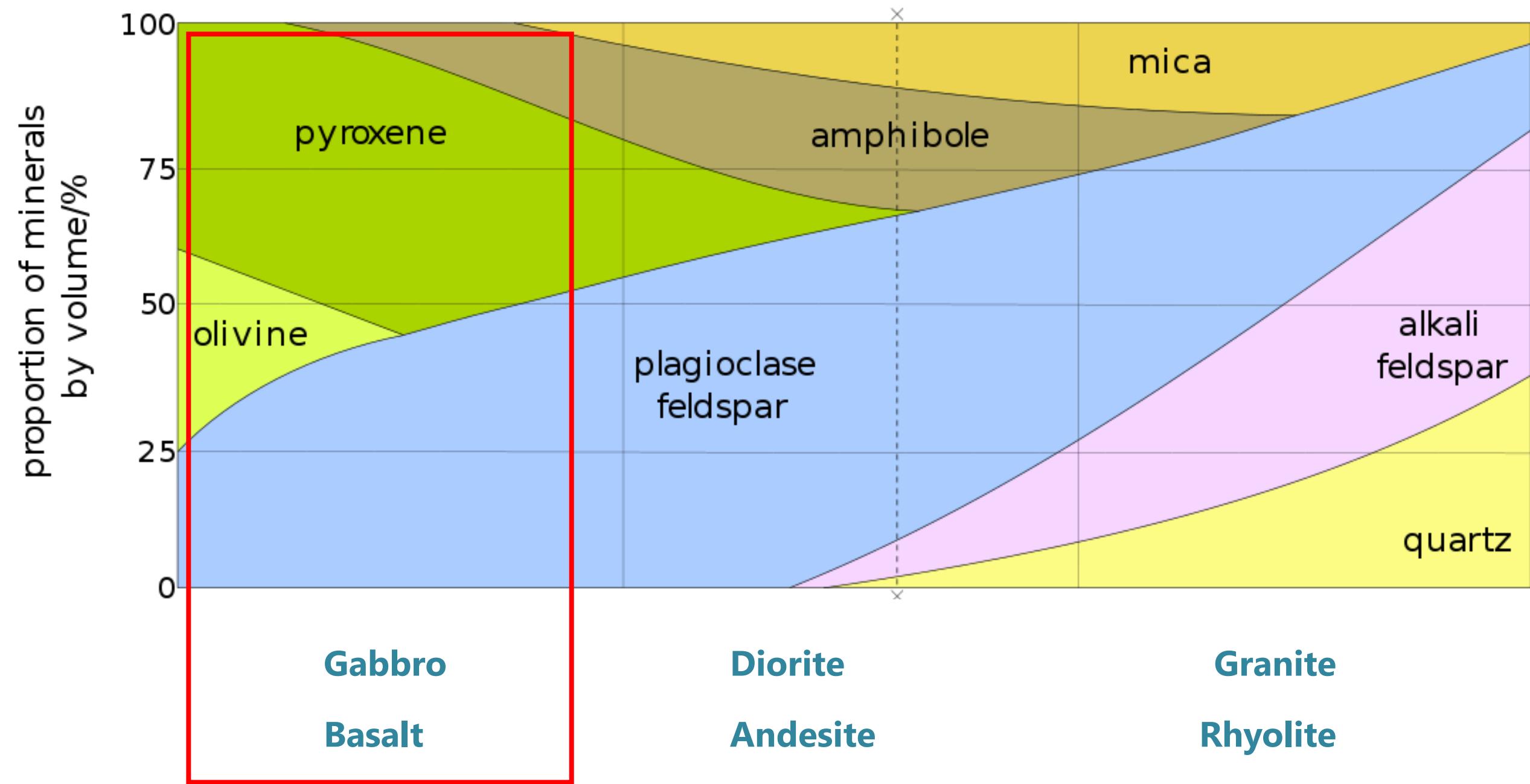












INTRUSION

GABBRO

Coarse-Medium

Phaneritic

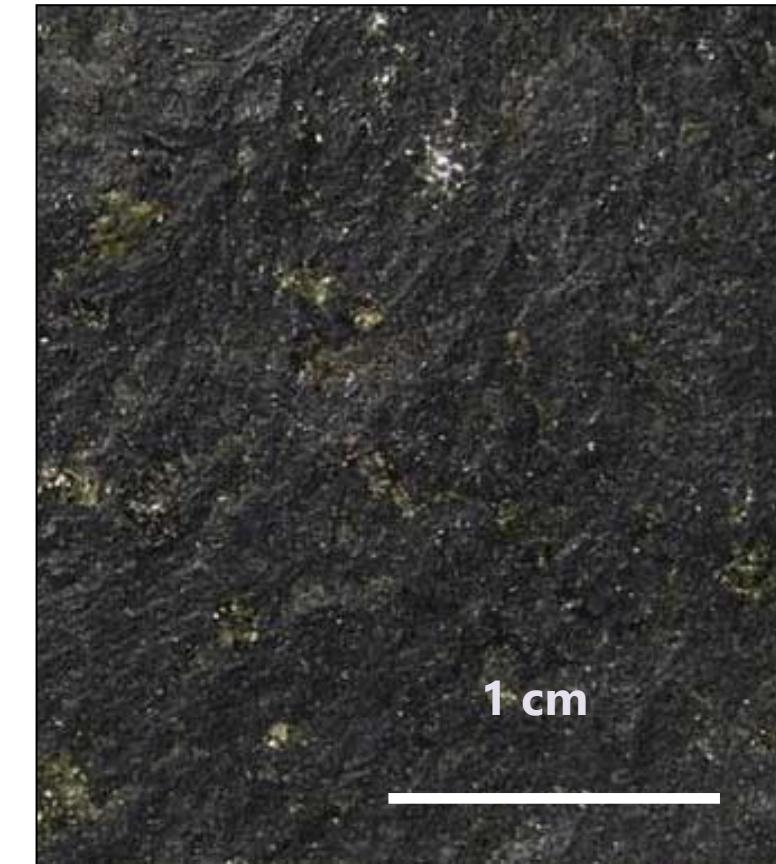


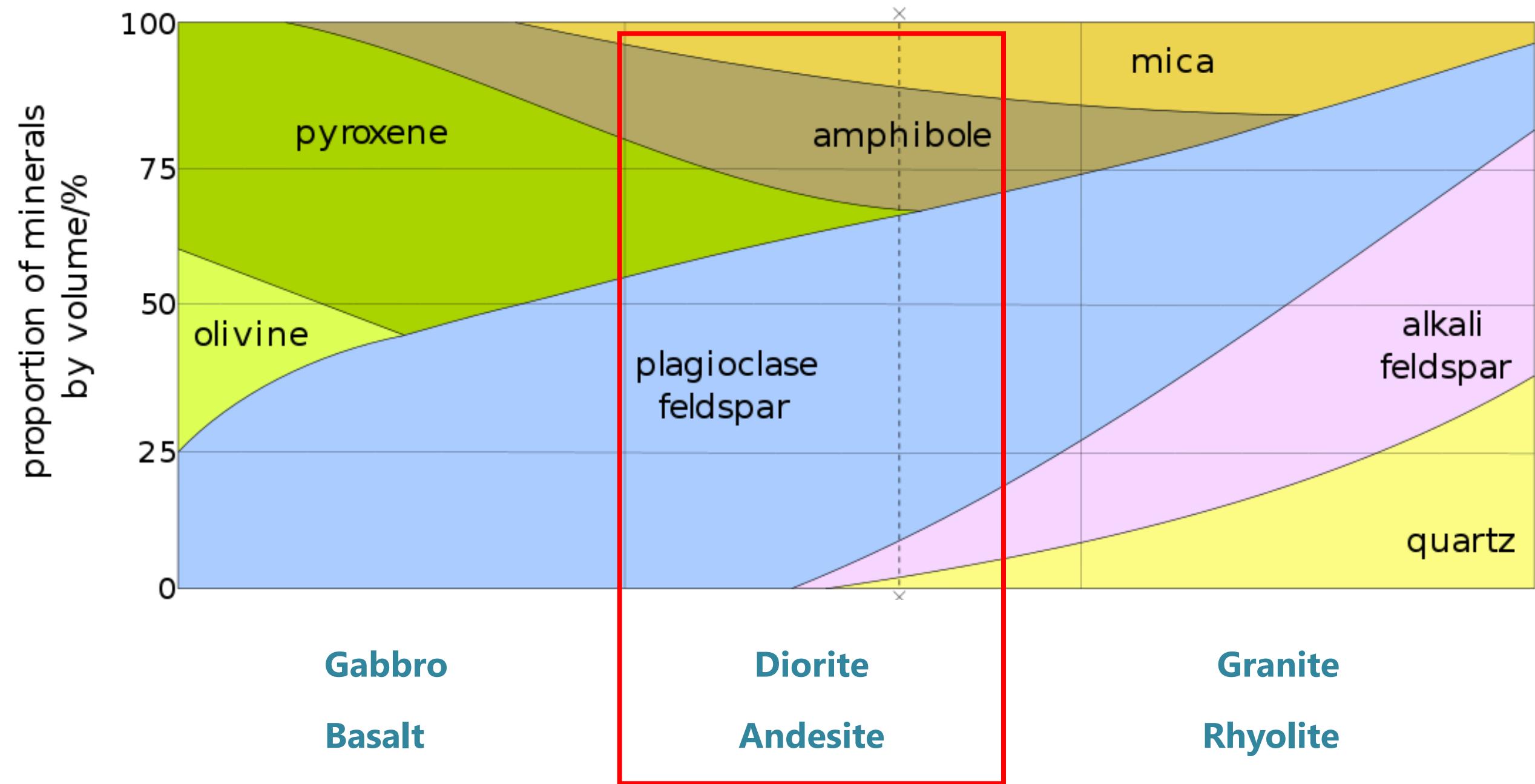
ERUPTION

BASALT

Fine

Aphanitic/porphyritic





INTRUSION

DIORITE

Coarse-Medium

Phaneritic



ERUPTION

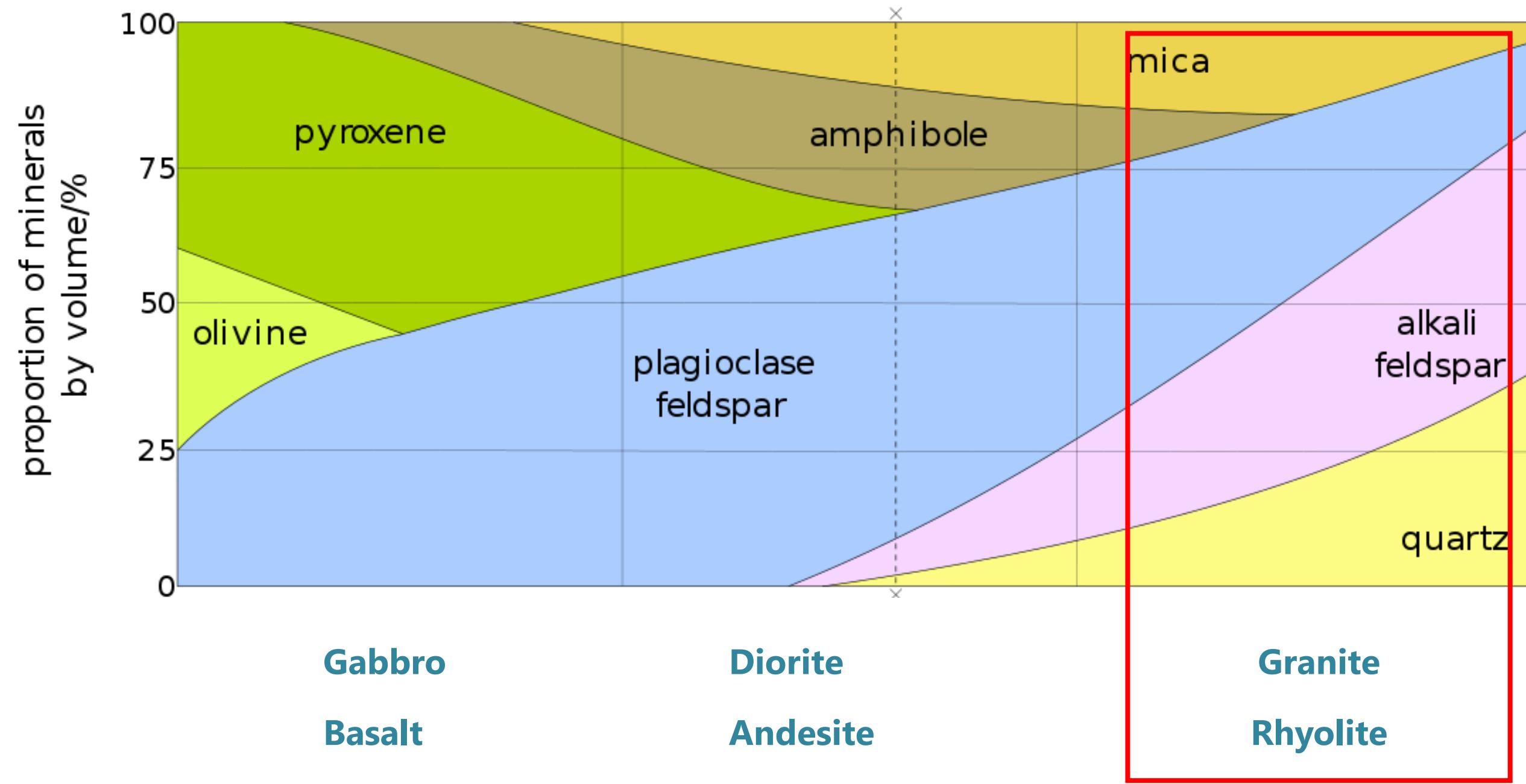
ANDESITE

Fine

Aphanitic/porphyritic



1 cm



INTRUSION

GRANITE

Coarse

Phaneritic/porphyritic

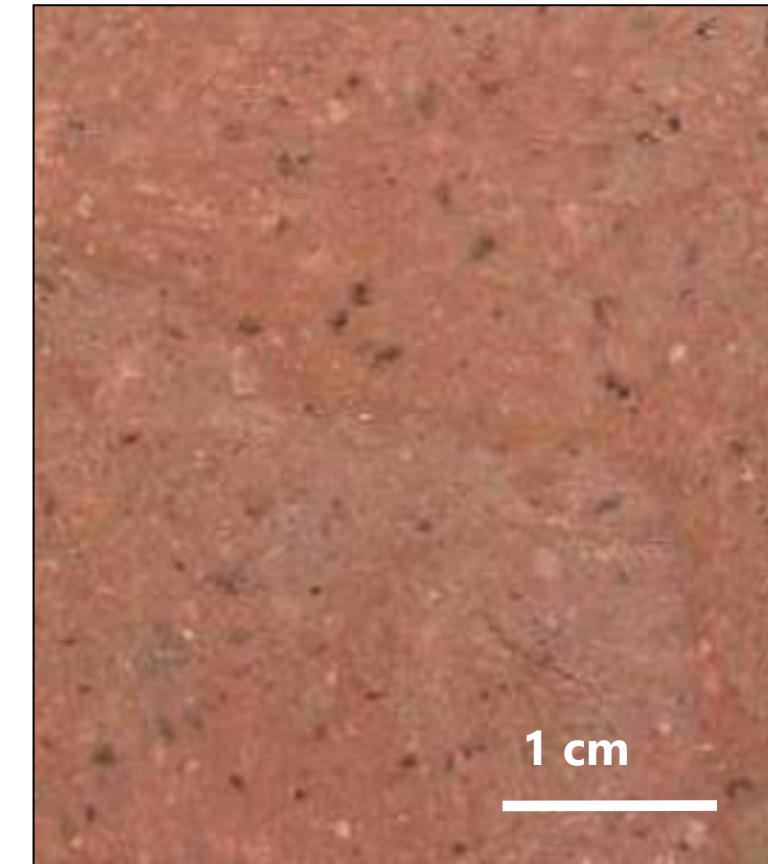


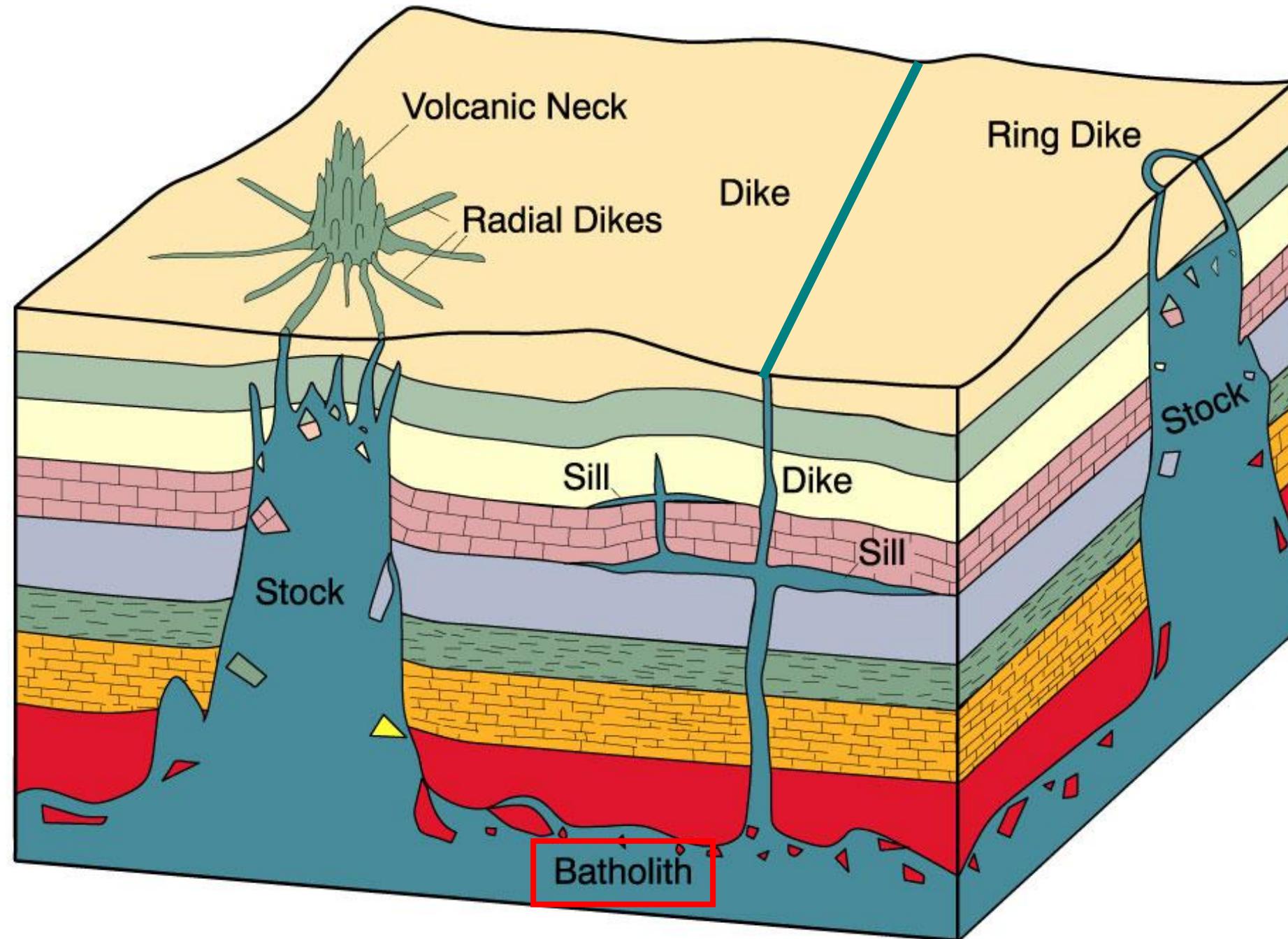
ERUPTION

RHYOLITE

Fine

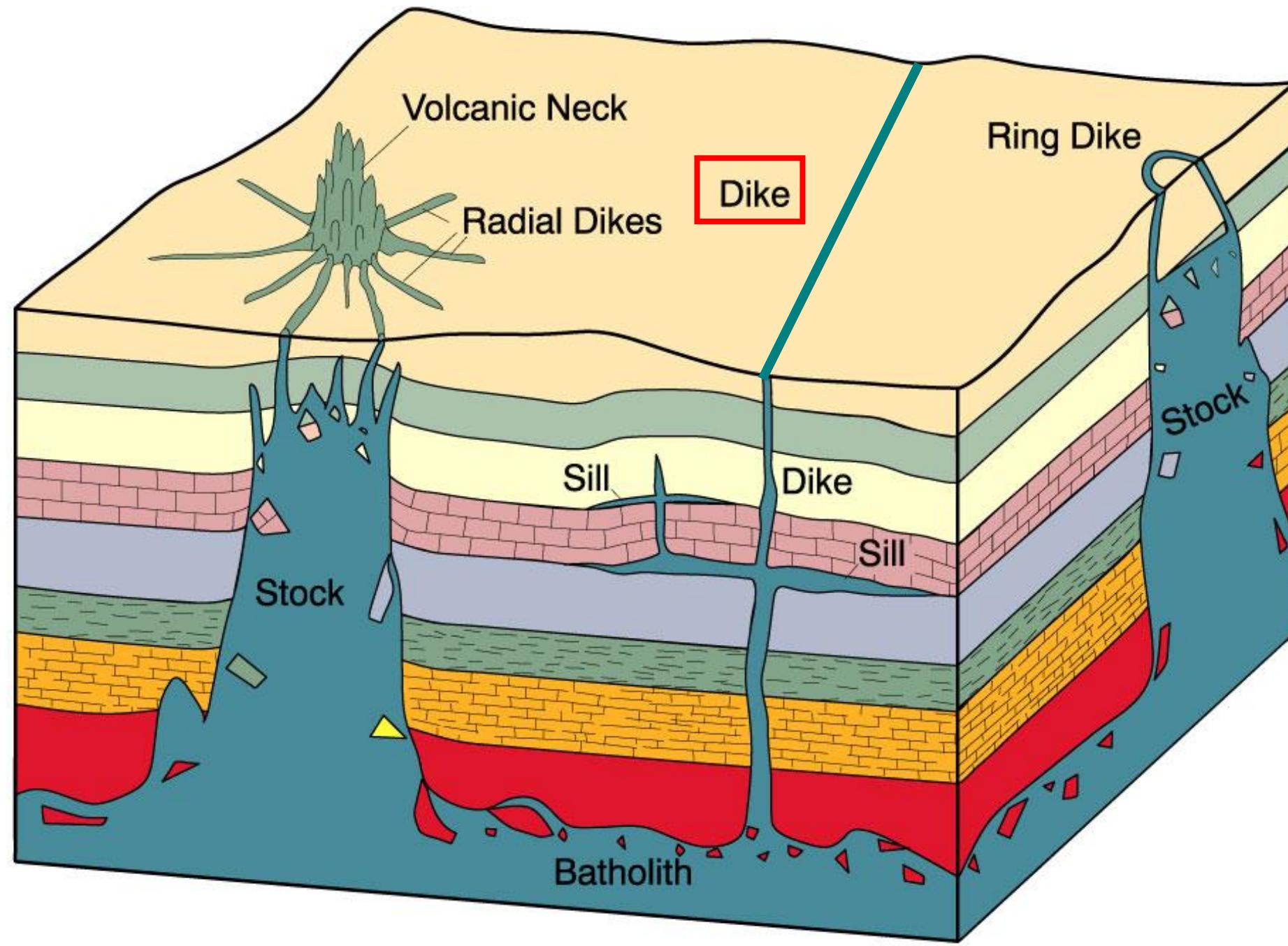
Aphanitic







Yosemite National Park
California

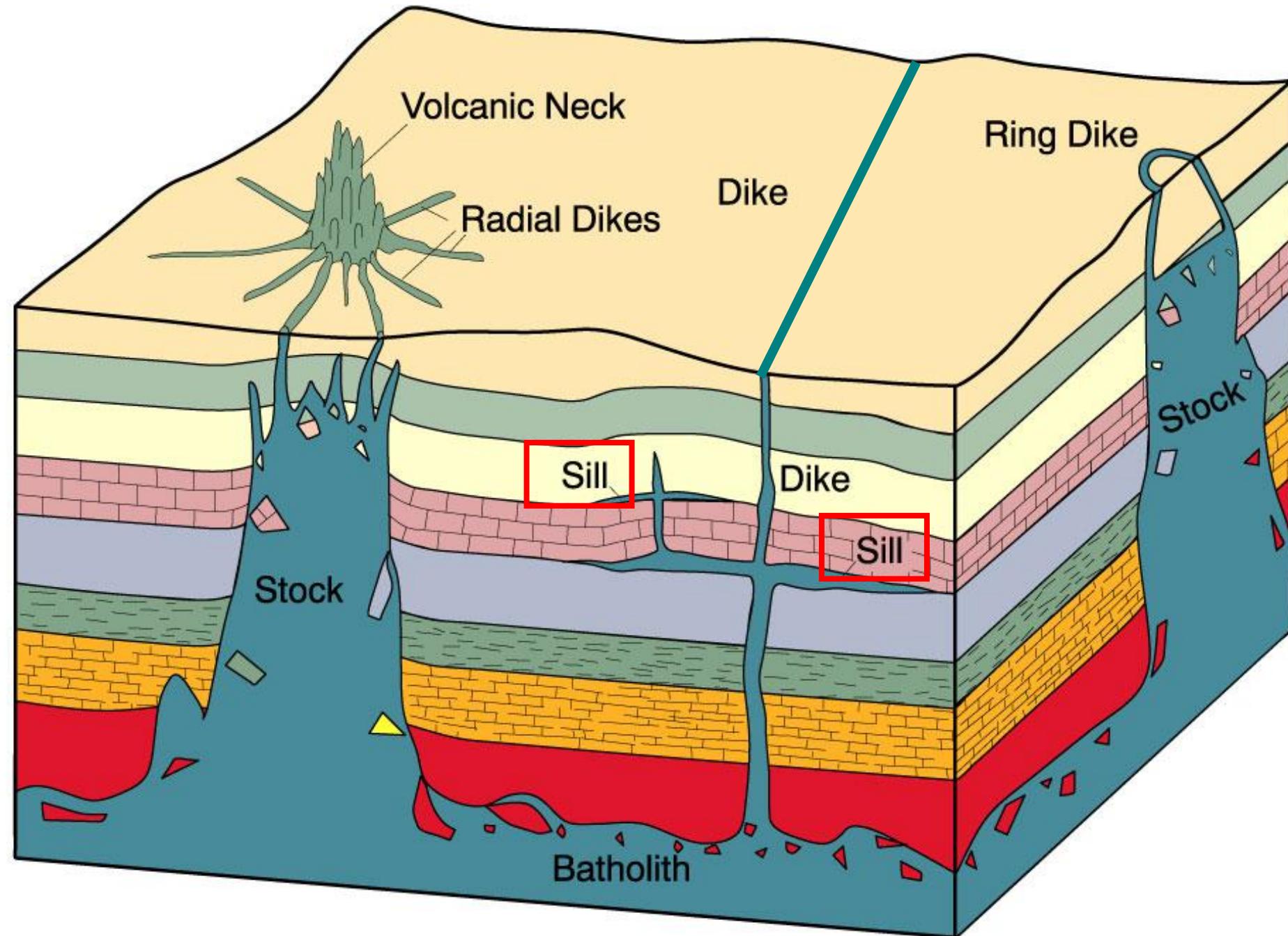


Achill
Mayo



Knockmahon
Waterford



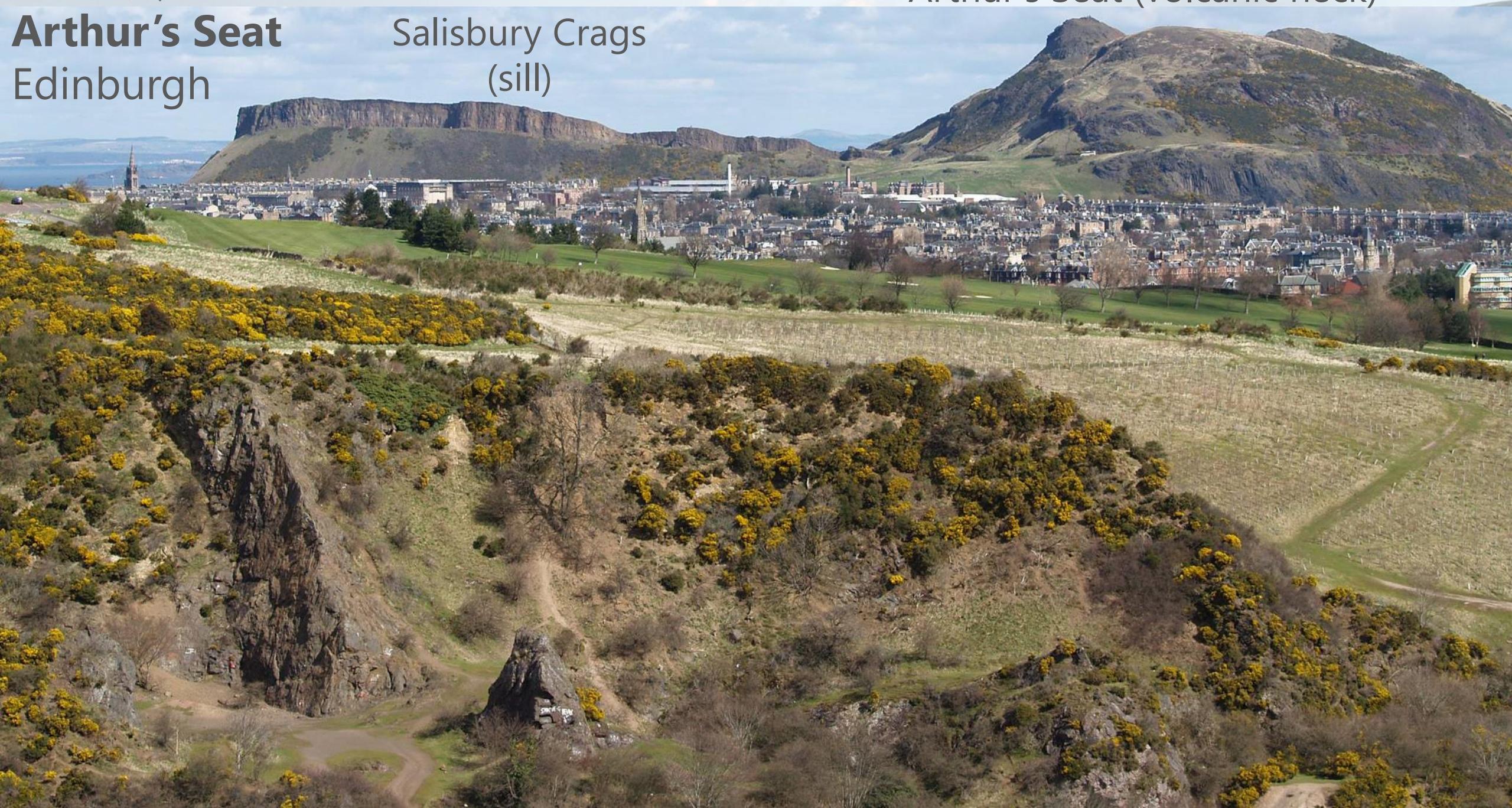


Volcanoes | Sills

Arthur's Seat Edinburgh

Arthur's Seat (volcanic neck) GY4051

Salisbury Crags
(sill)

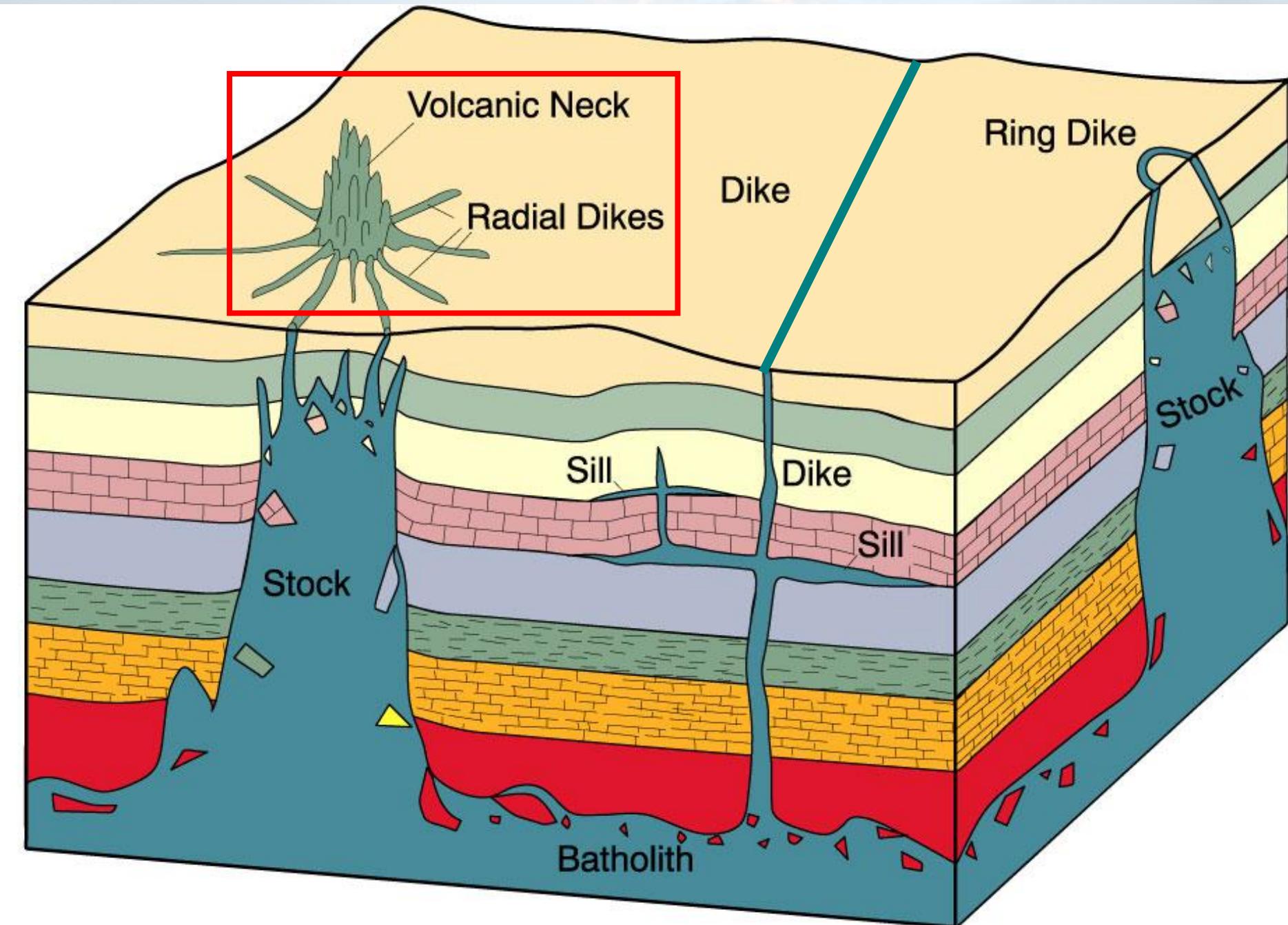


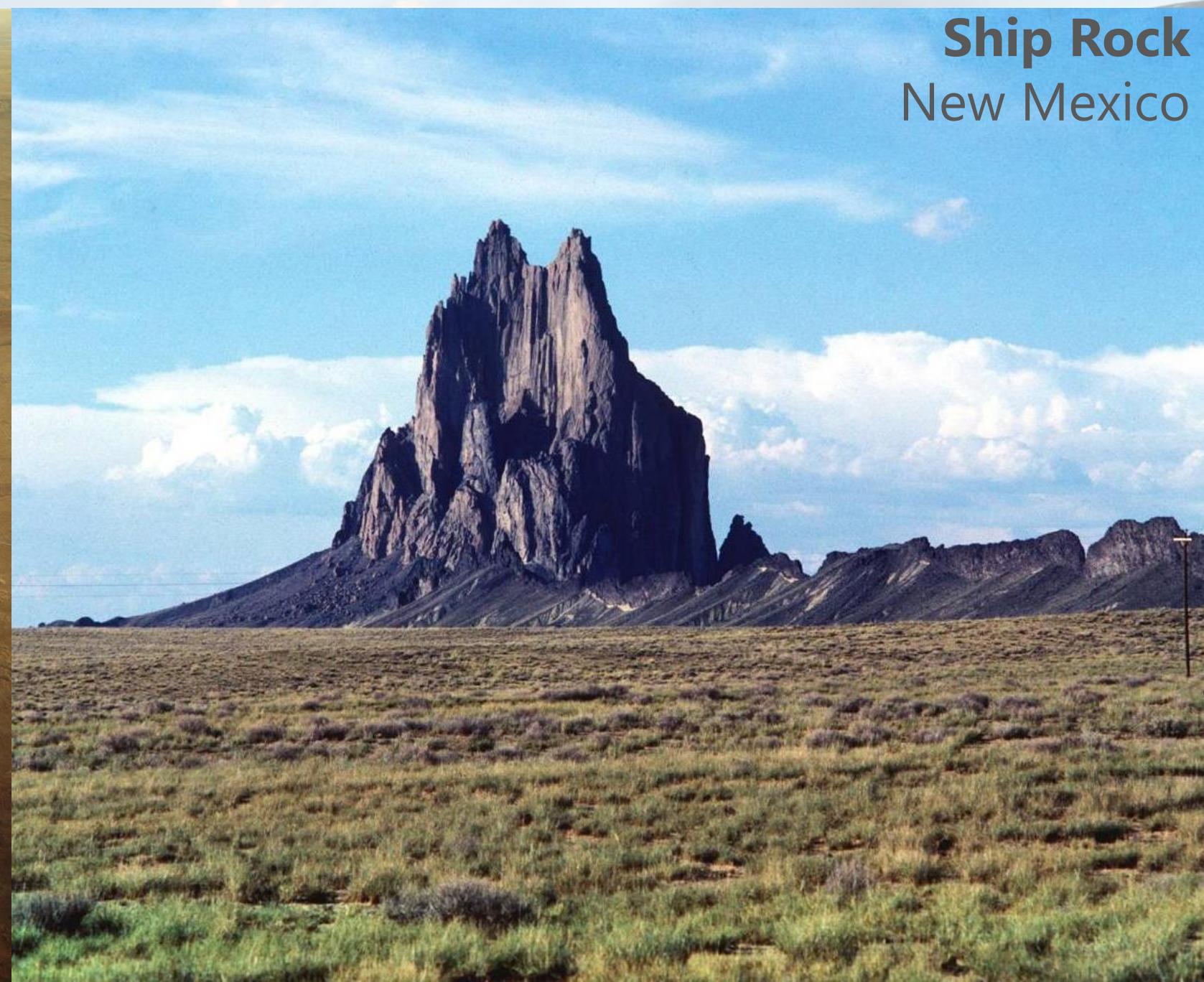
Arthur's Seat

Edinburgh

Salisbury Crags
(sill)







Ship Rock
New Mexico





© Leigh Hilbert Photography





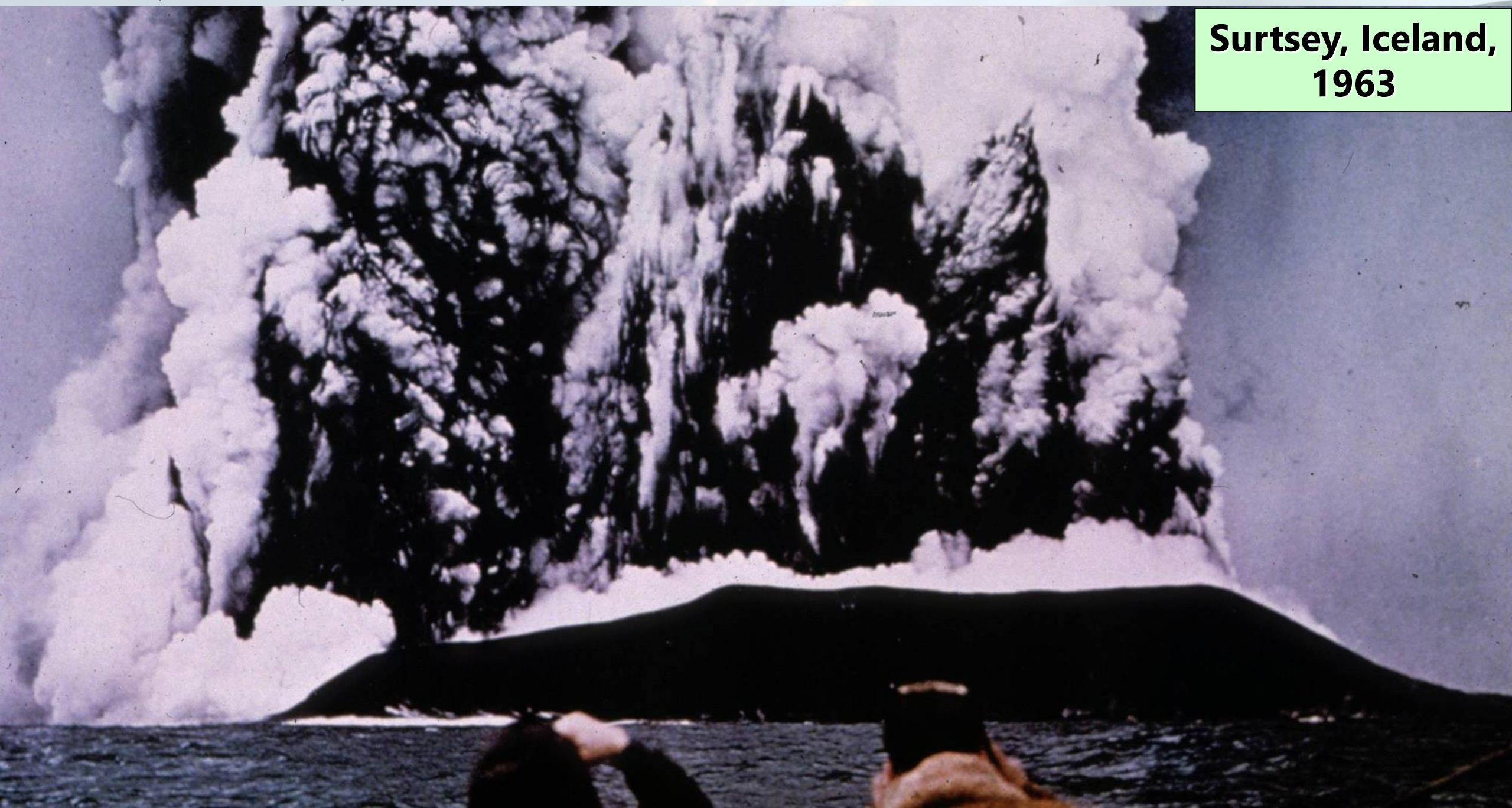




... during ...

... after





**Surtsey, Iceland,
1963**

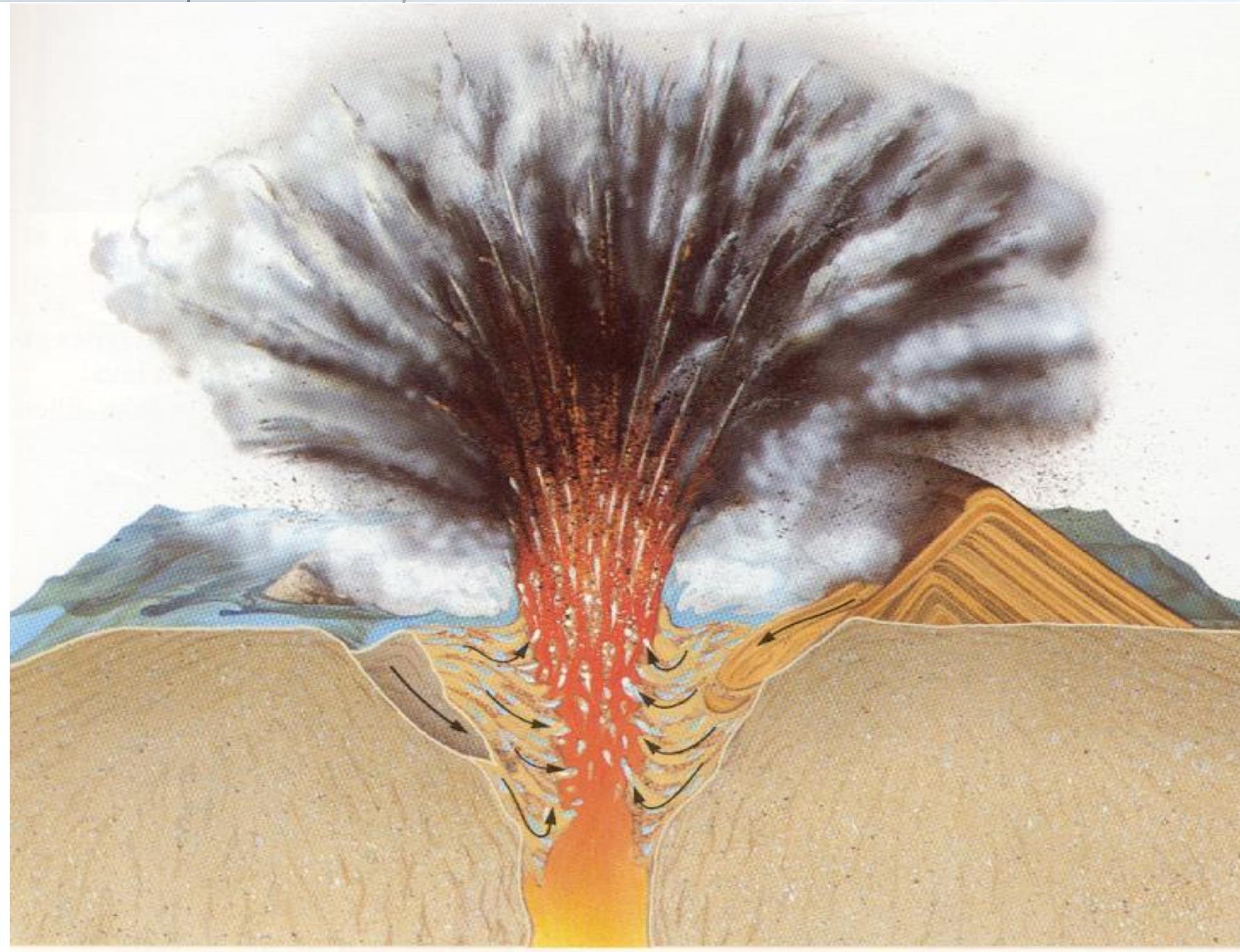


Eyjafjallajökull, 2010

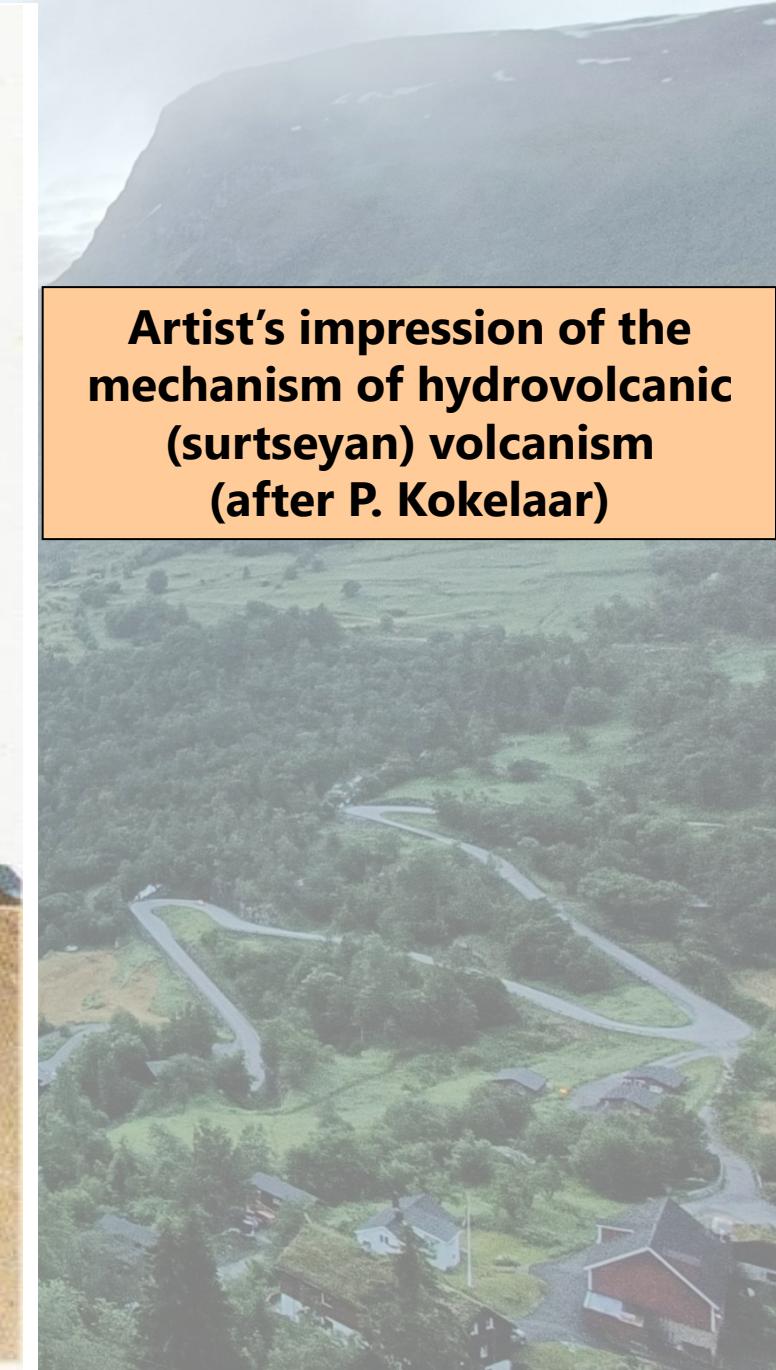


Eyjafjallajökull, 2010

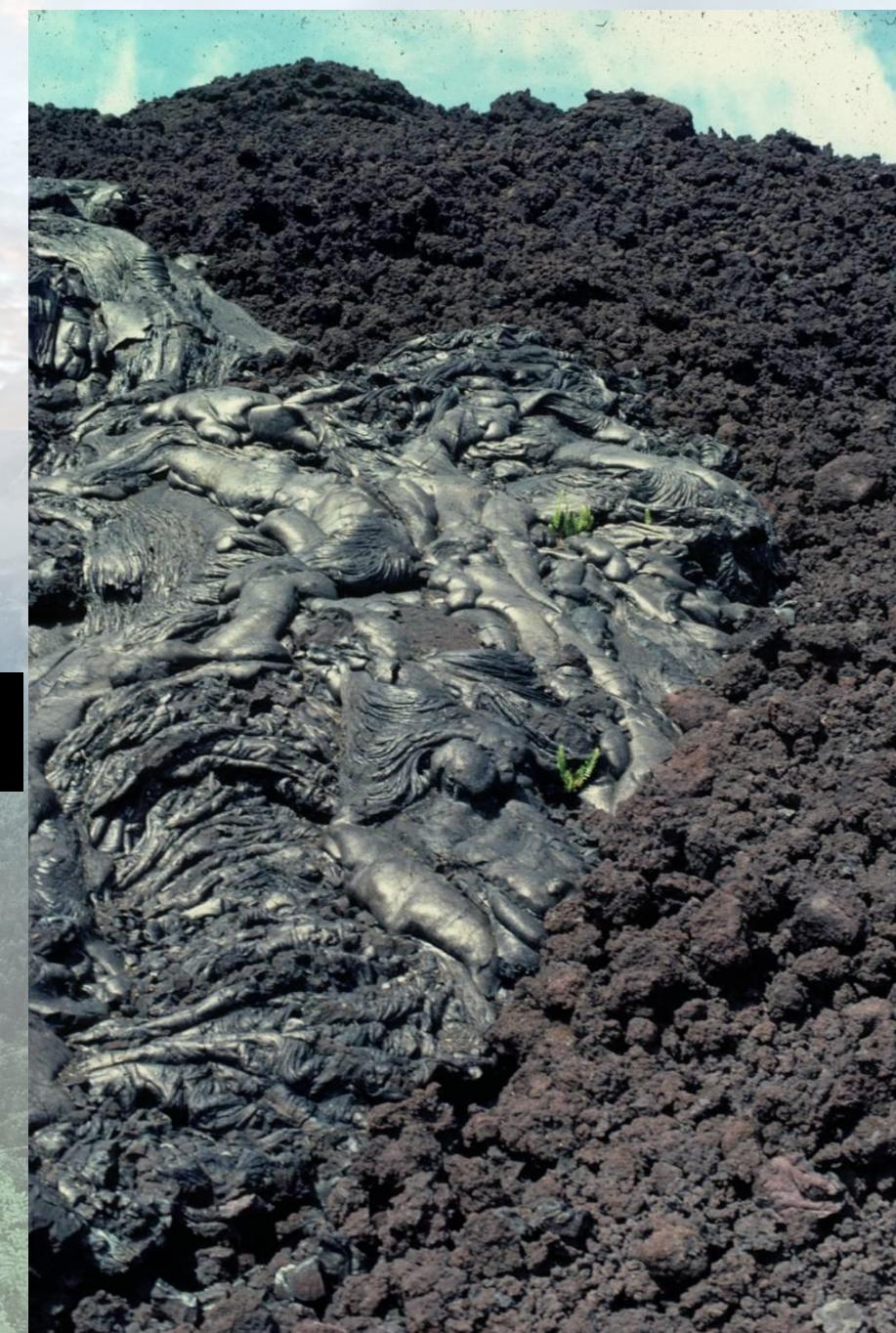
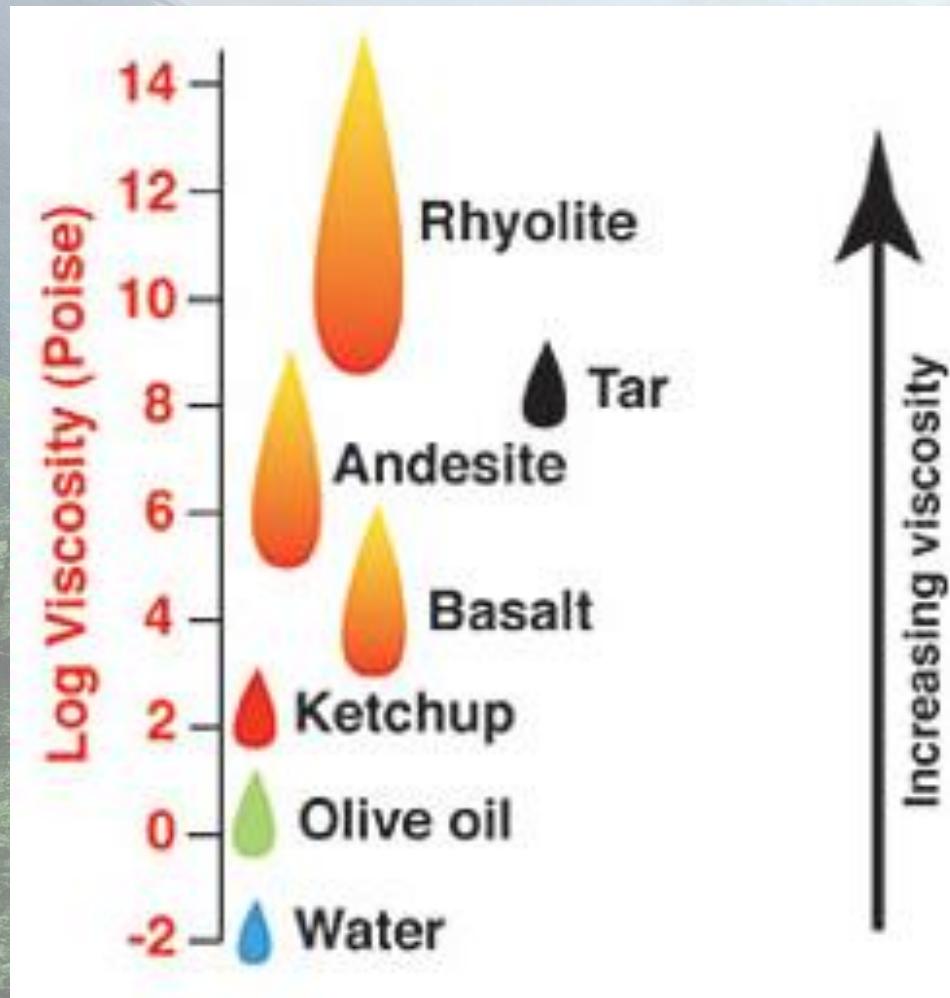
FLIGHT



**Artist's impression of the
mechanism of hydrovolcanic
(surtseyan) volcanism
(after P. Kokelaar)**

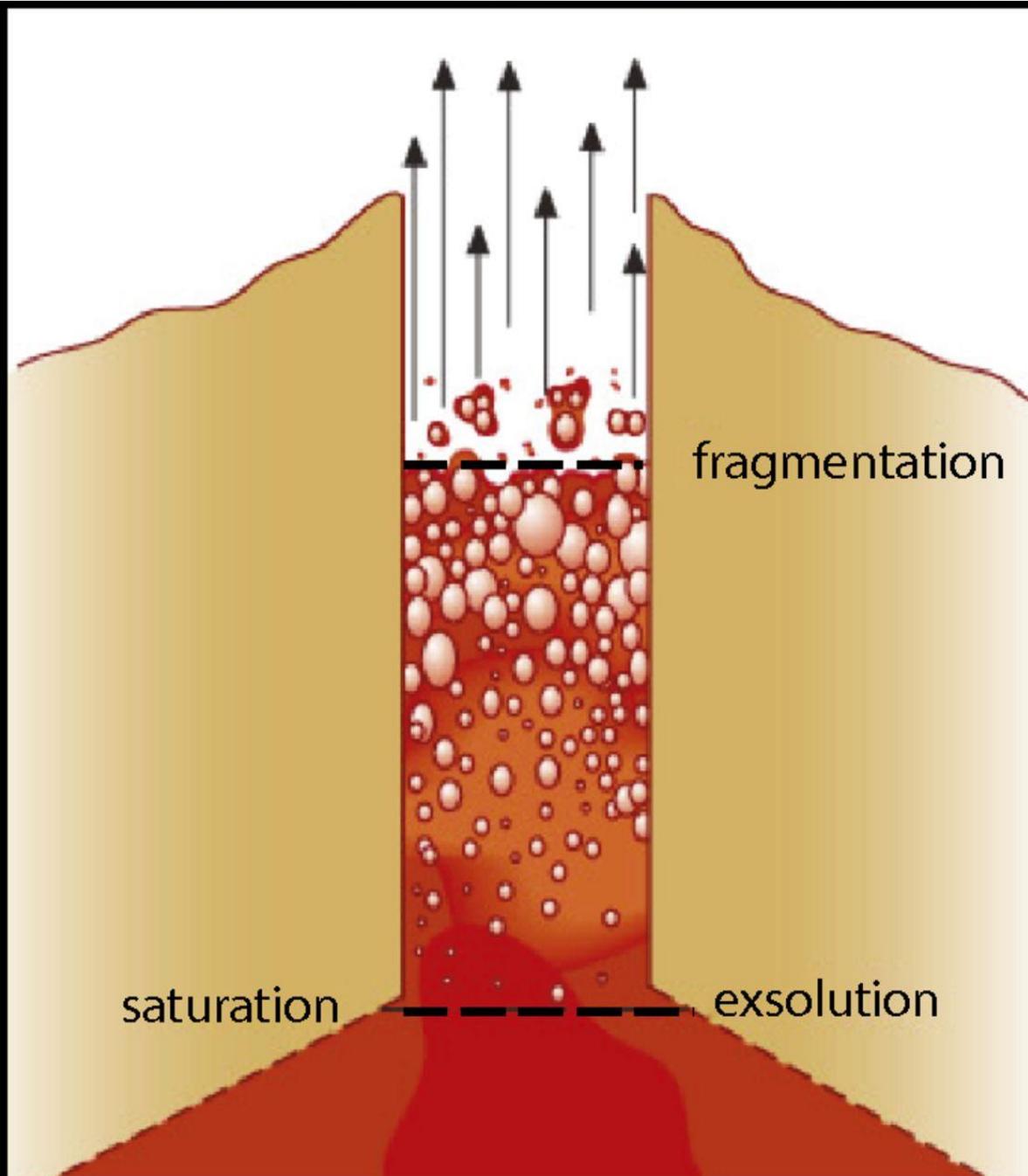






pahoehoe

aa























Montserrat

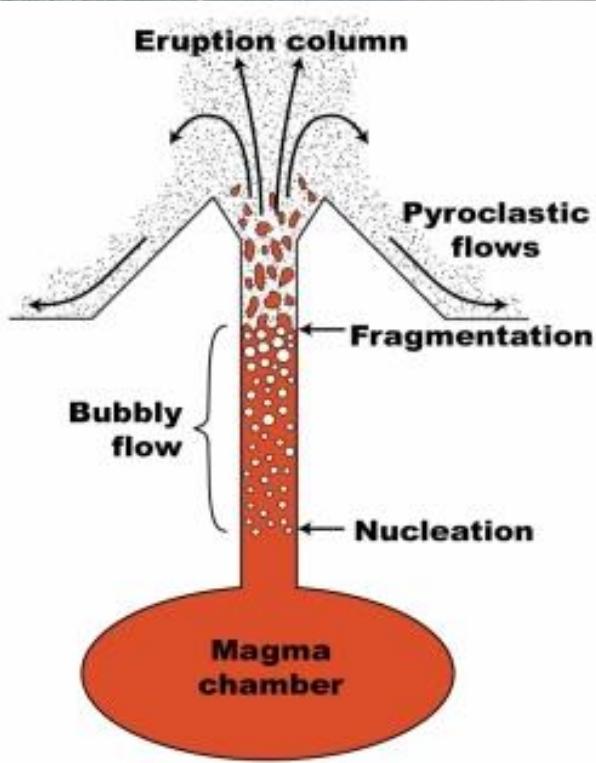


Taal, Phillipines, 14 January 2022



Mayon Volcano,
Philippines, 1984

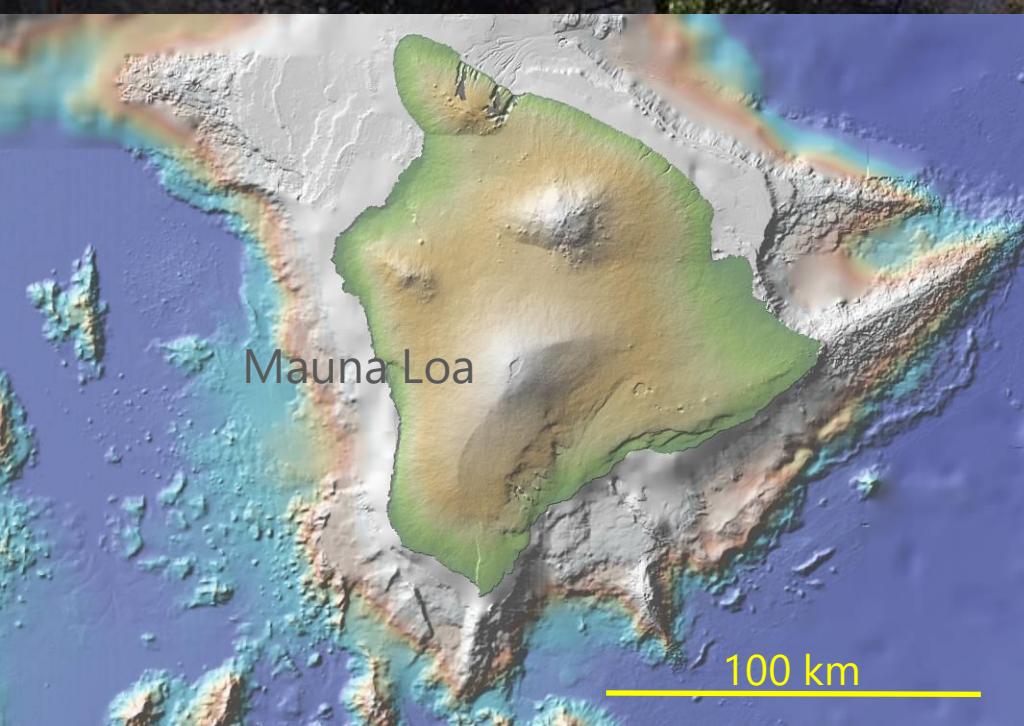
Unzen, Japan,
June 24, 1993







Pompeii was overwhelmed by a pyroclastic flow during the AD 79 eruption of Vesuvius



Composite volcanoes

have what we think of as typical
volcano shapes

A composite volcano, Mount Mayon, viewed from across a valley filled with green rice fields.

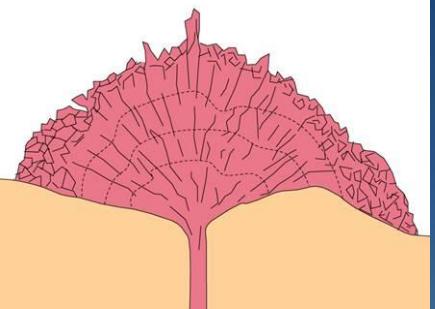
Mayon
Philippines



Composite volcanoes

have what we think of as typical
volcano shapes

Mt Fuji, Japan



Mt. Lassen
Cascades

Laki Iceland



Types of volcano drawn at the same scale



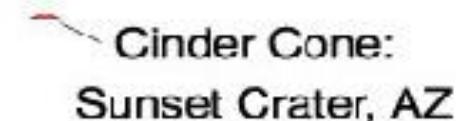
Shield Volcano: Mauna Loa, HI
basic lava (low viscosity)



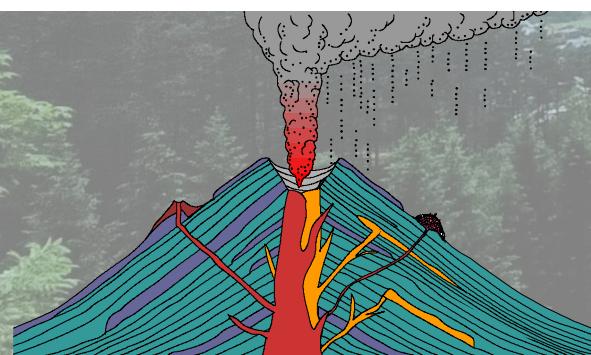
Composite Volcano:
Mt. Rainier, WA.



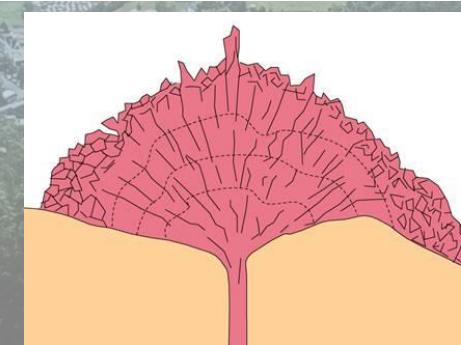
Dome:
Lassen Peak, CA



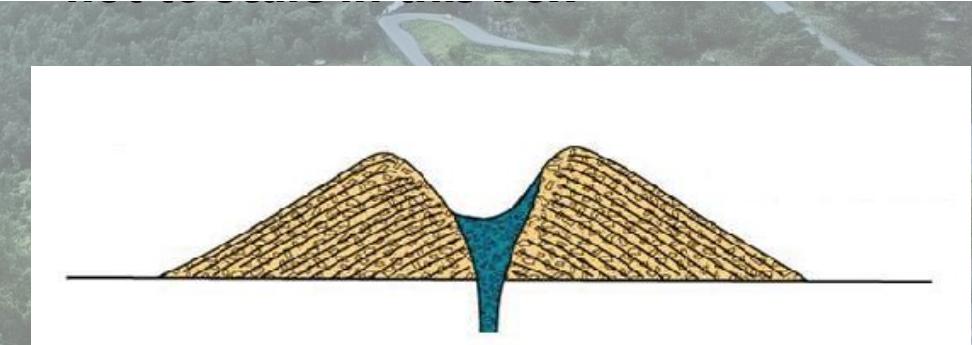
Cinder Cone:
Sunset Crater, AZ



lava and ash

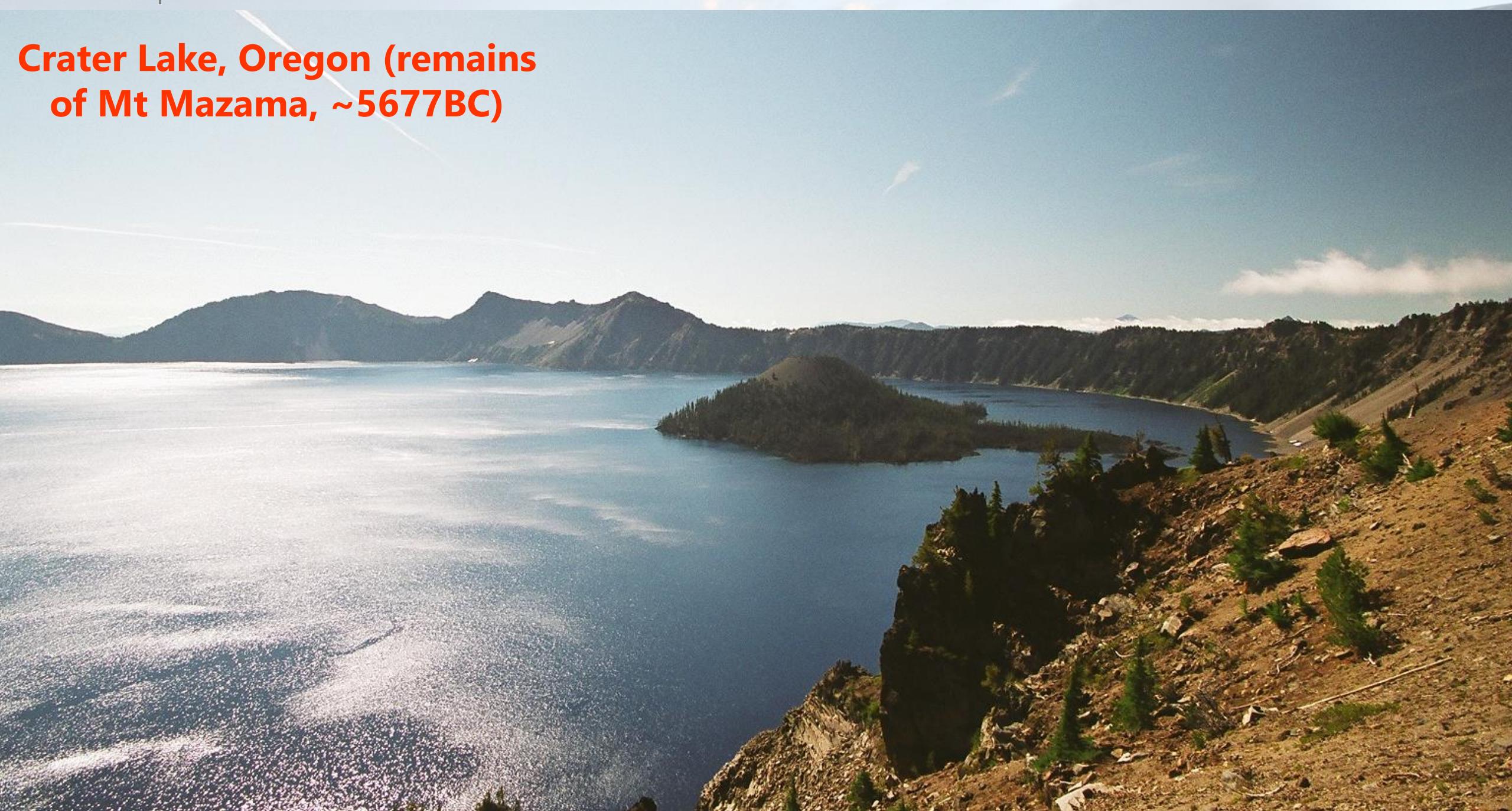


silicic lava
(high viscosity)



cinders and
volcanic bombs

**Crater Lake, Oregon (remains
of Mt Mazama, ~5677BC)**





Solfatara Crater, Campi Flegrei, Napoli



Solfatara Crater, Campi Flegrei, Napoli



The mythological home of the
Roman God of Fire, Vulcan

Solfatara Crater, Campi Flegrei, Napoli



Still has hot mud pools and volcanic gas vents called fumaroles. Closed to tourists since 3 died in 2017.

Solfatara Crater, Campi Flegrei, Napoli



Solfatara Crater, Campi Flegrei, Napoli



Large rock ejected from eruption of Solfatara crater, visible in the roadside right behind where I took the previous photo

Monte Nuovo Crater



Monte Nuovo Crater



Name literally means “New Mountain”
– it formed in 1538

Vesuvius crater



The buildings in Pompeii, like this one...



**...are literally made
from volcanic ash**



Naples, Italy – as seen from the crater of Vesuvius



Naples, Italy – as seen from the crater of Vesuvius

The islands and peninsulas at the far end of the bay are in Campi Flegrei



Lava flow







Suspected layout of Iran's Fordo nuclear plant

Tunnels believed to be 80-90m (260-295ft) below ground

