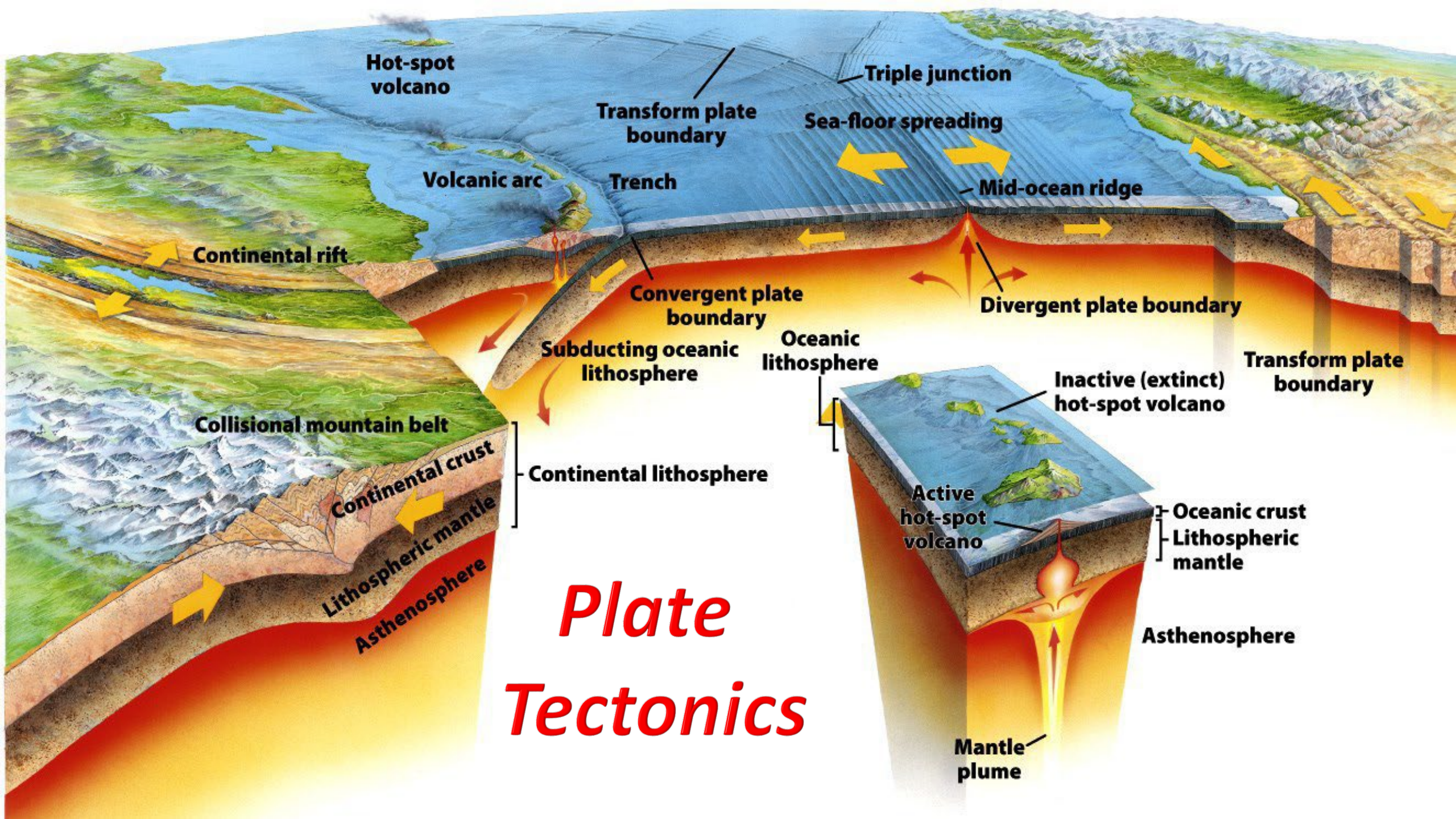


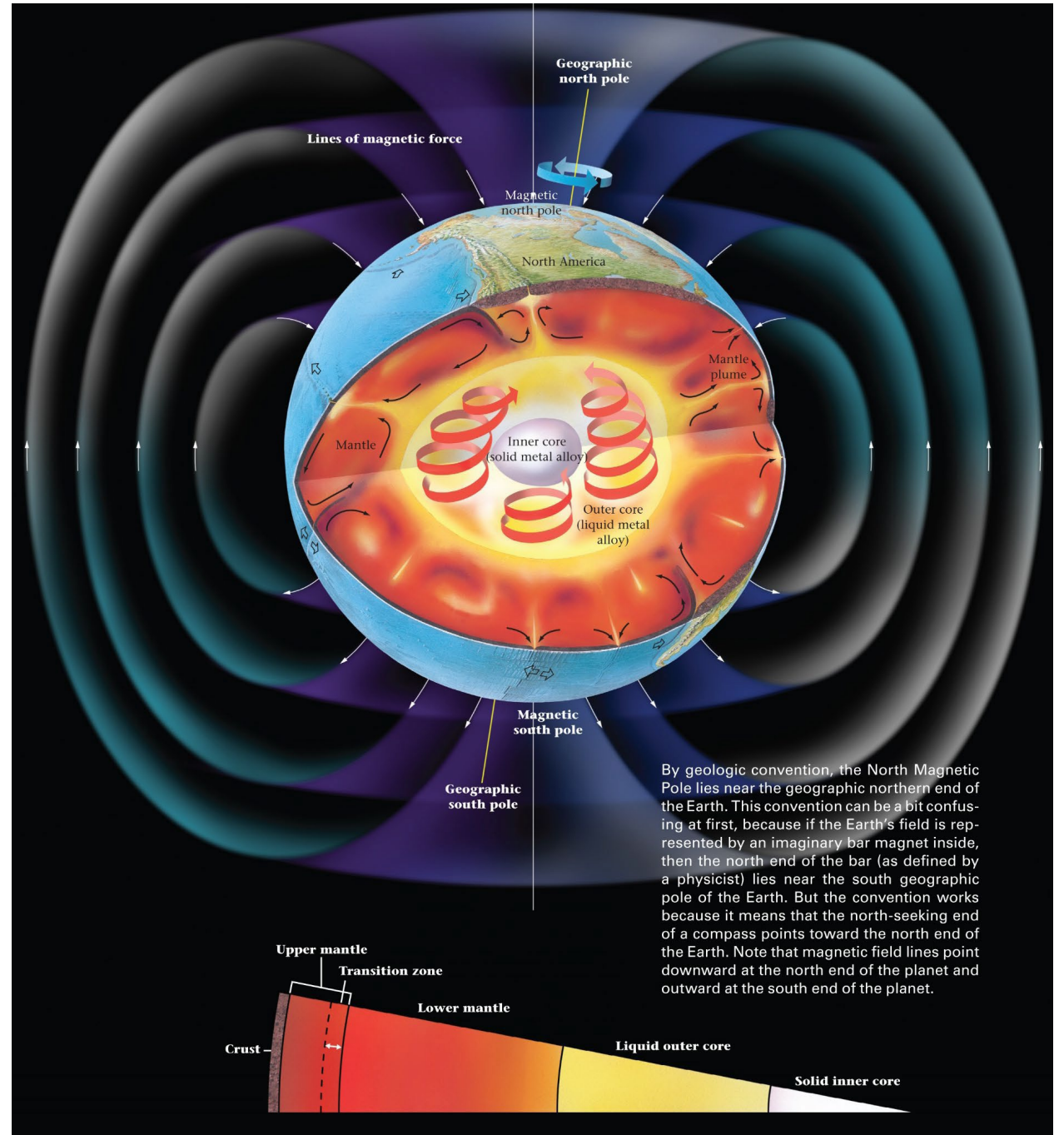
# Iceland's Environmental History



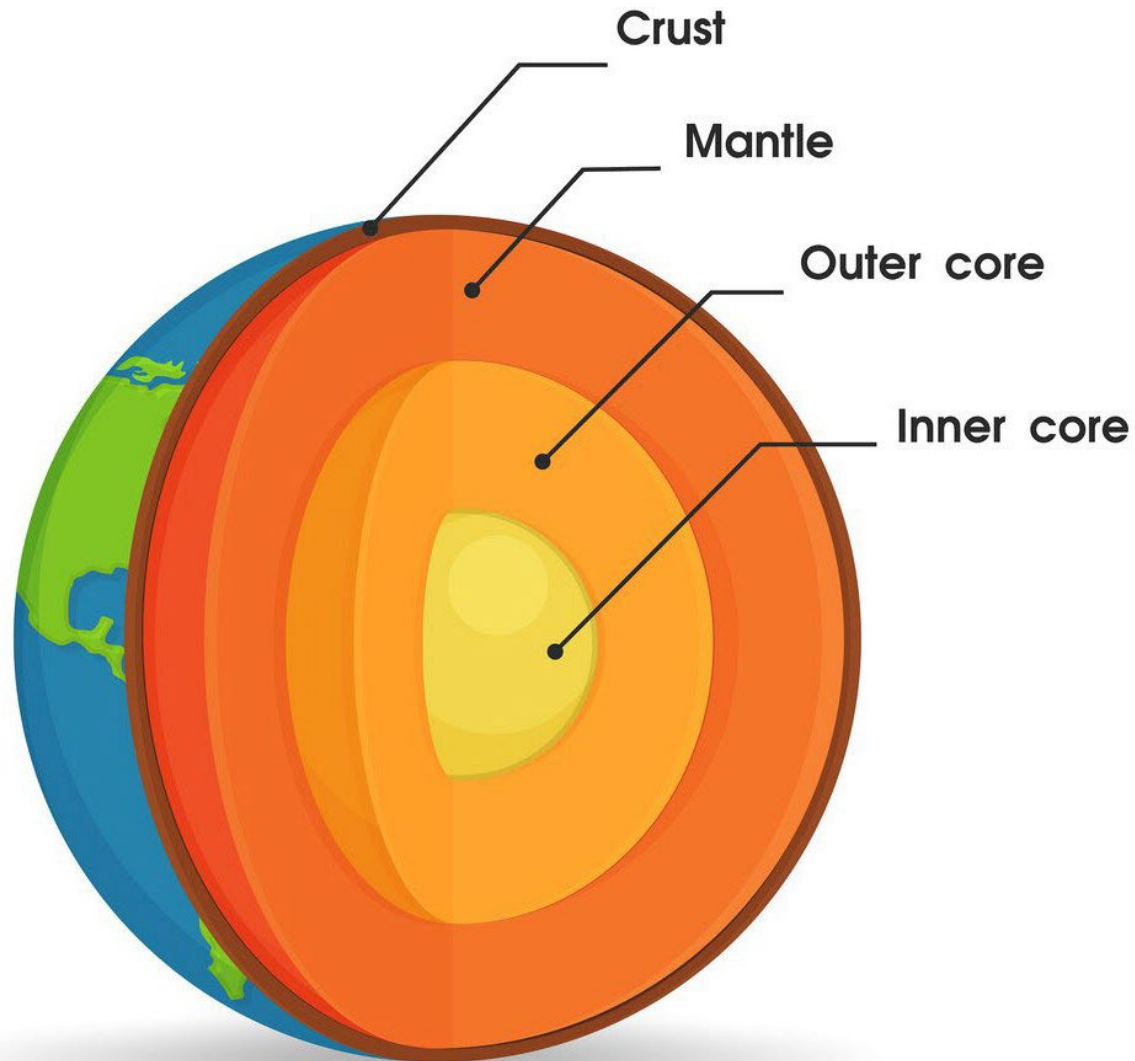


# Big idea

The Earth's interior is in constant motion through the processes of convection, with important consequences for the surface.



# Long Lasting Energy



- The Crust acts as insulation
- Radioactive decay
- Friction through the transfer of energy and matter

# Big Idea

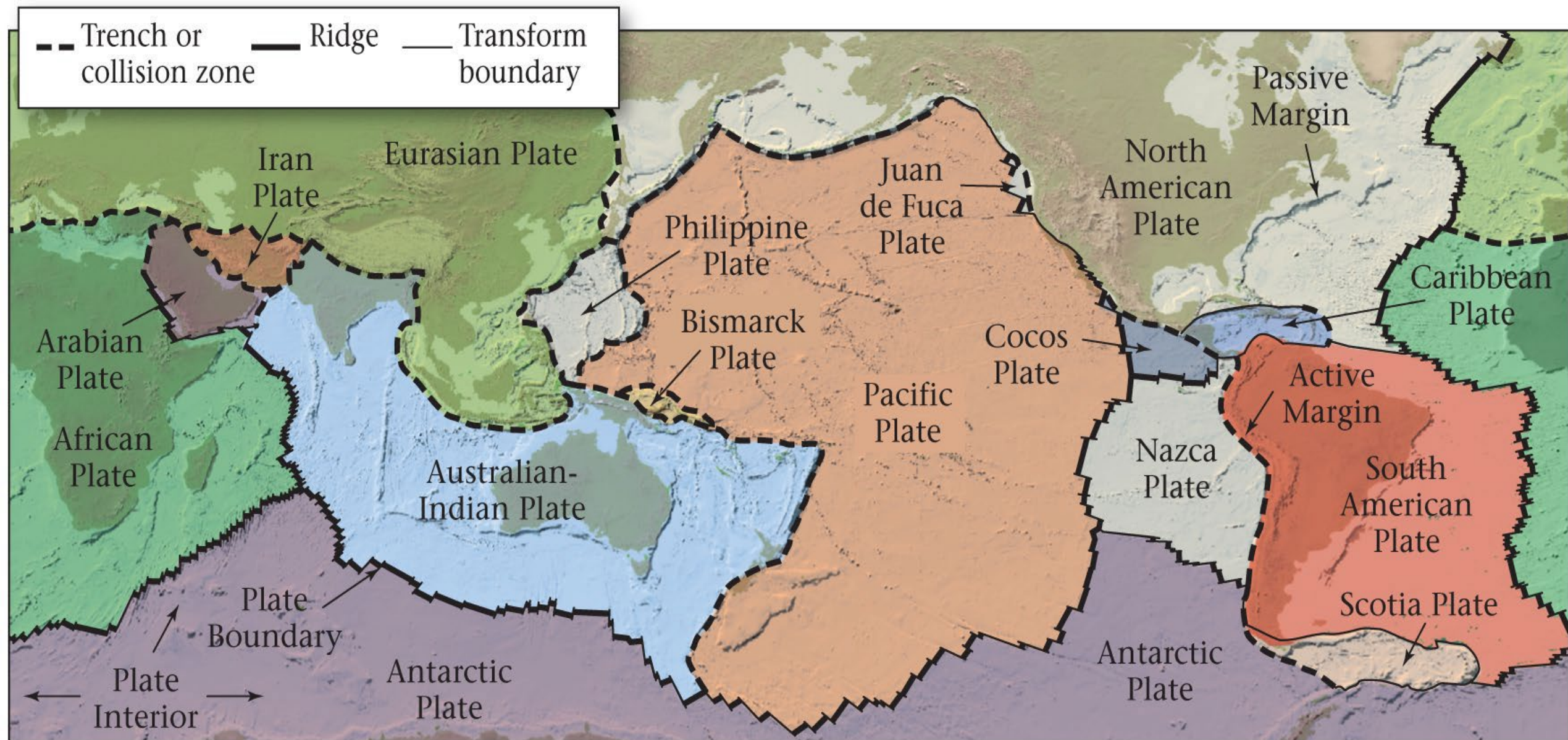
The Earth's tectonic plates consist of rocky crust (lithosphere), the upper most mantle, and move slowly with respect to one another.



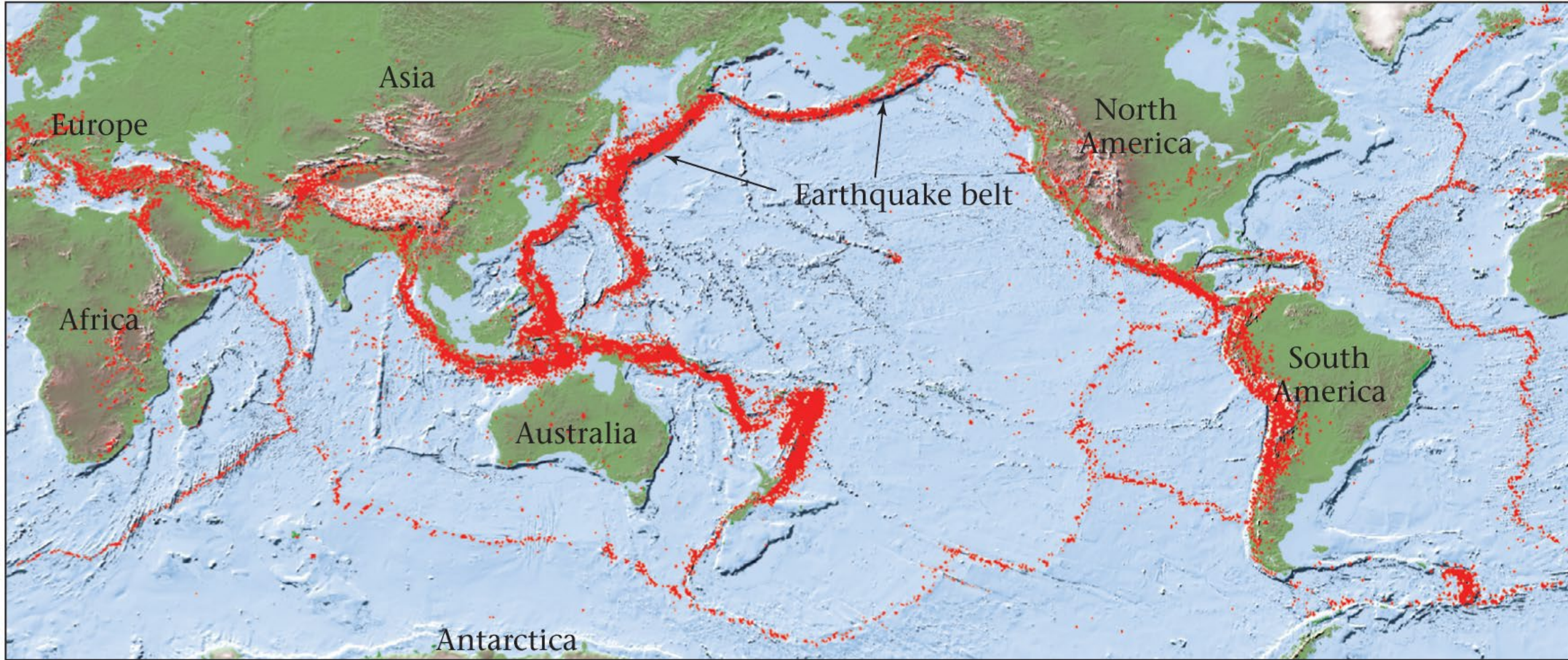
# Continental VS Oceanic Crust



# Plate boundaries

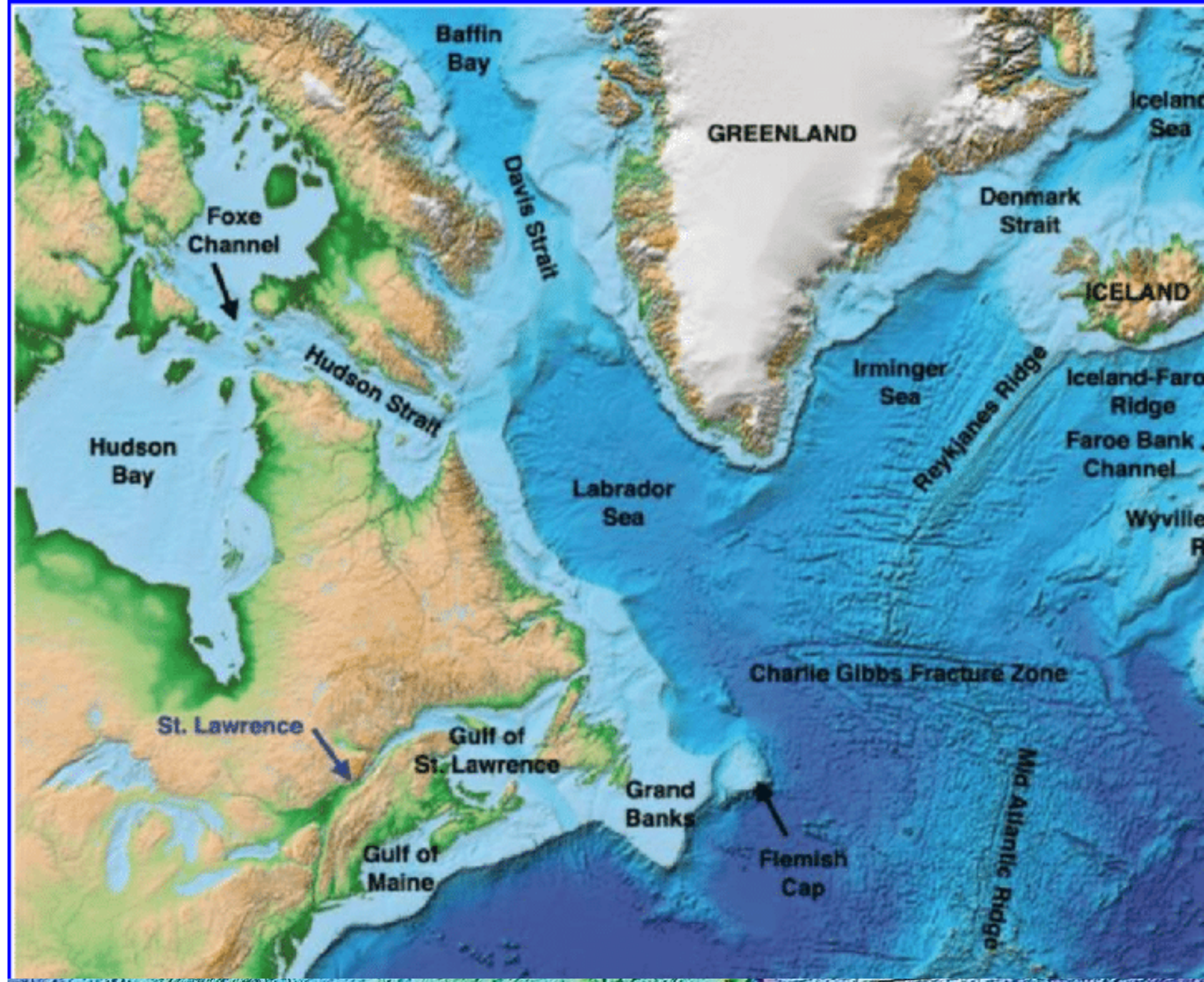


Big idea Many active geologic processes occur at plate boundaries.

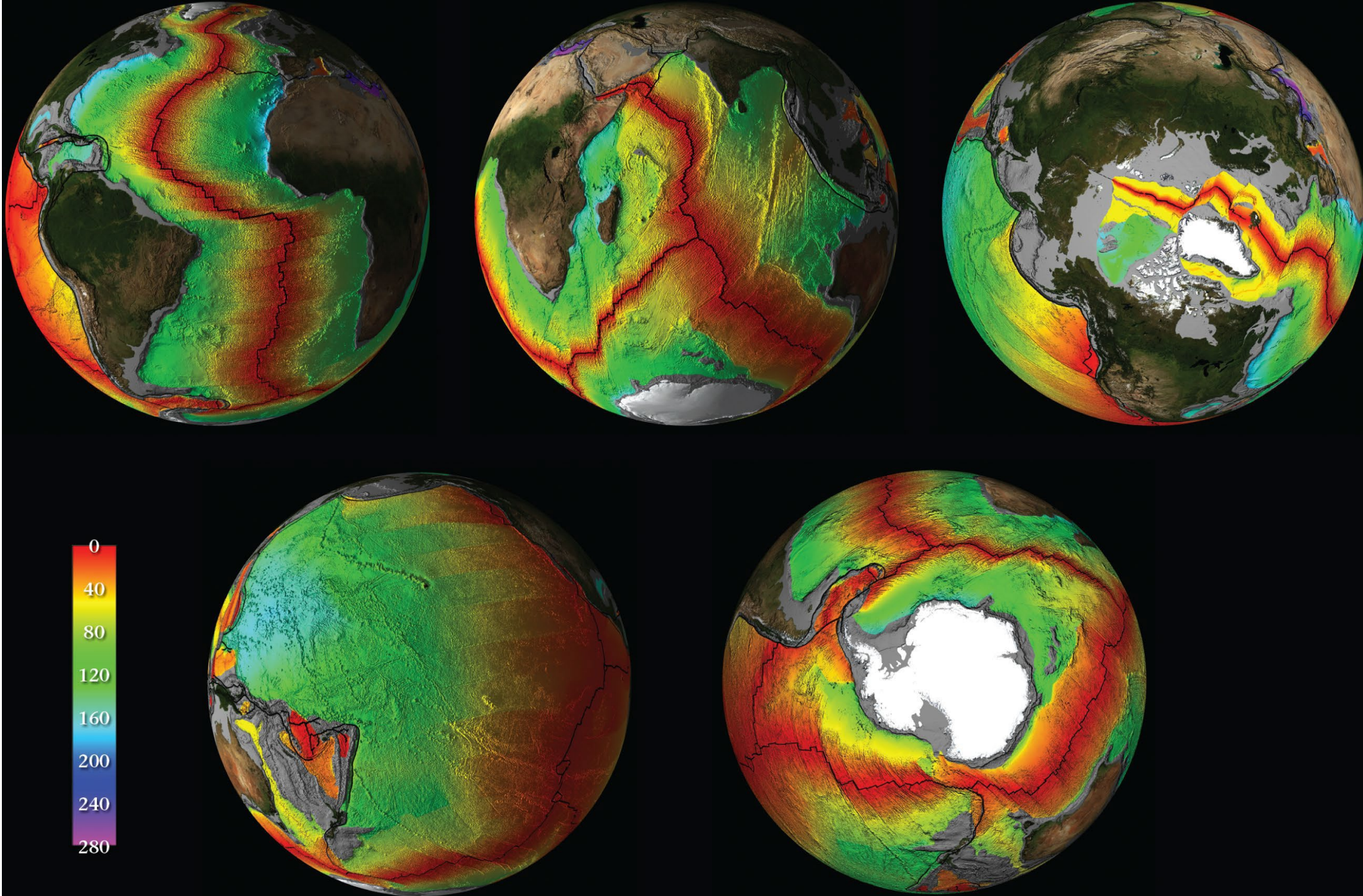


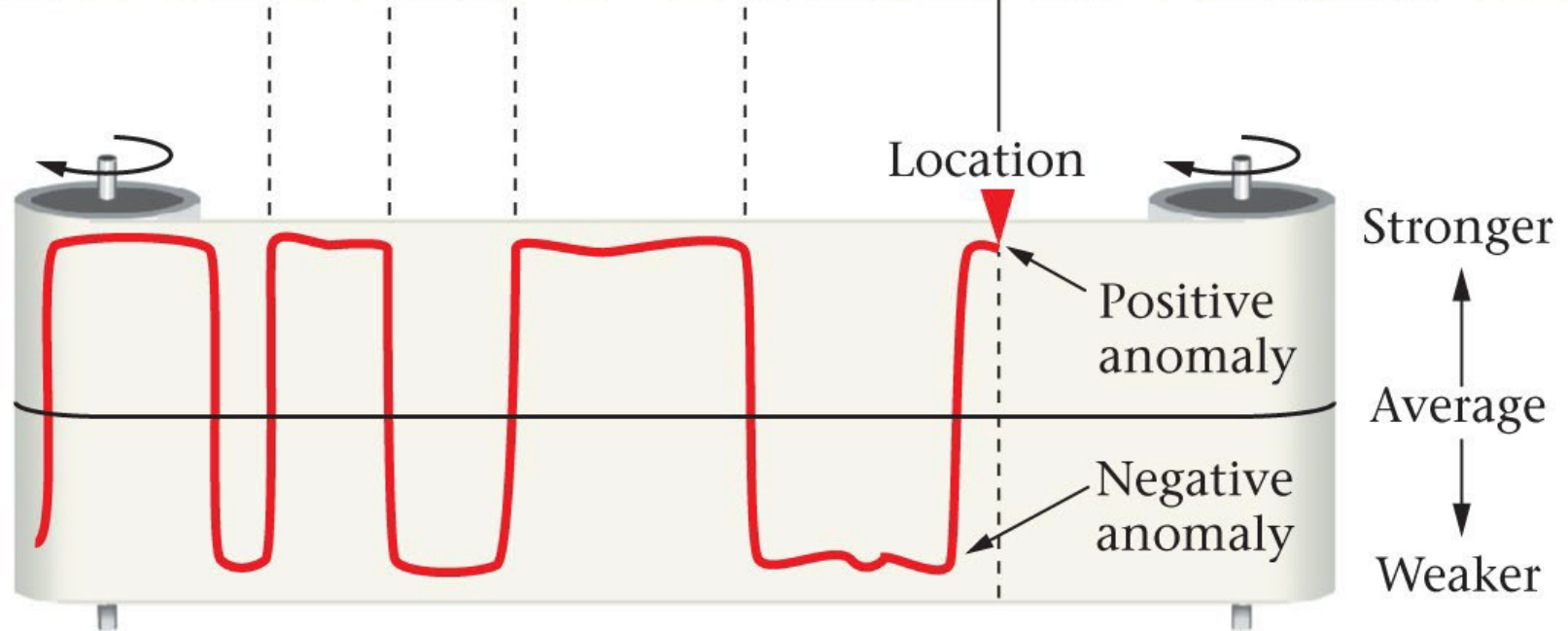
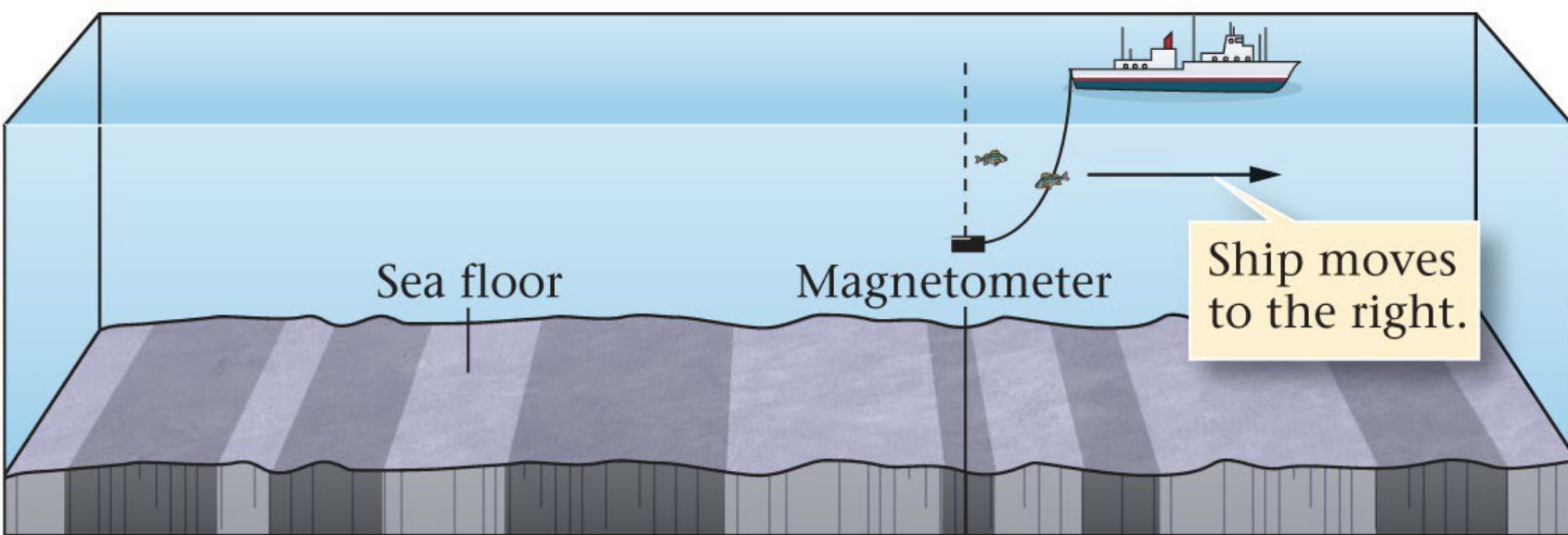
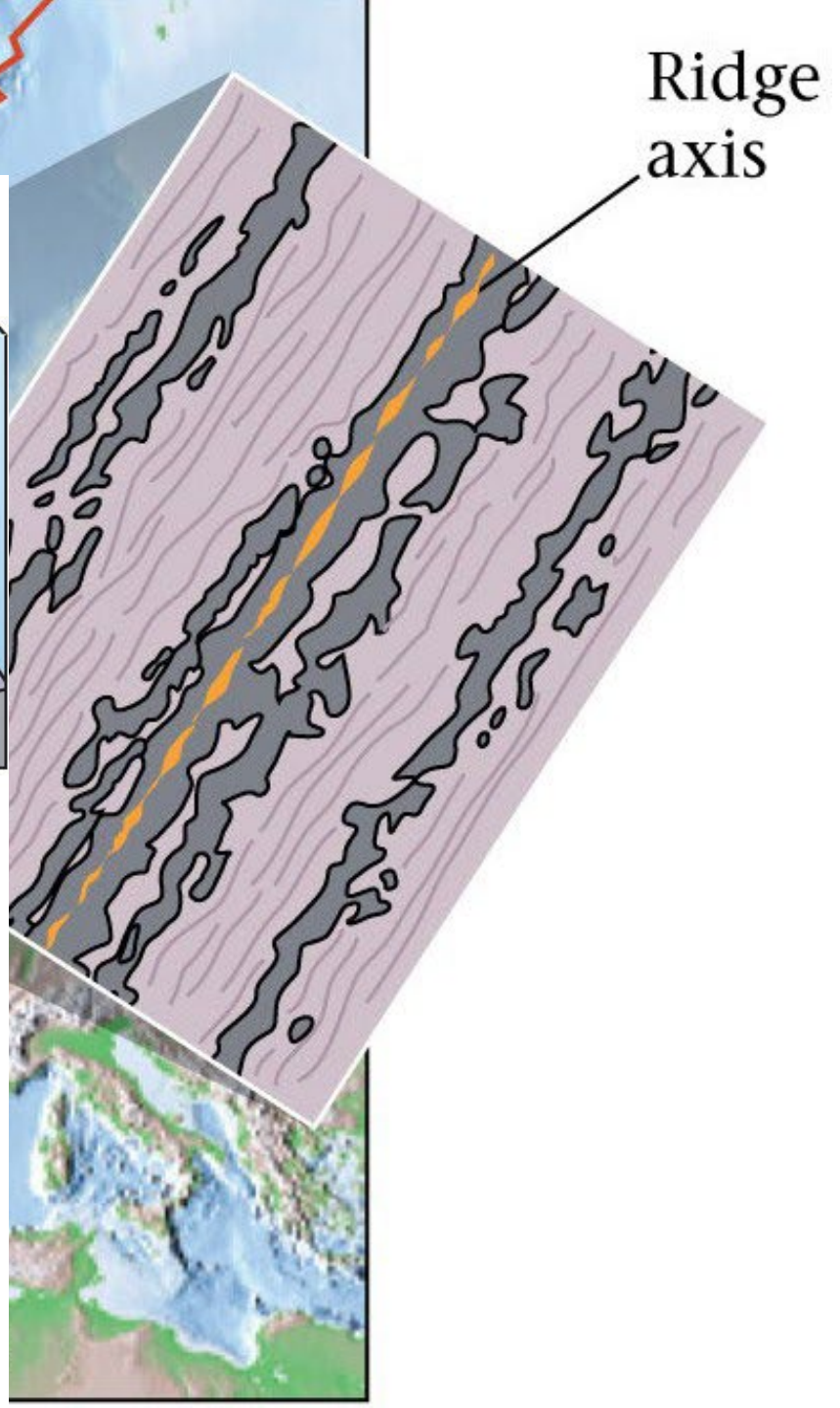


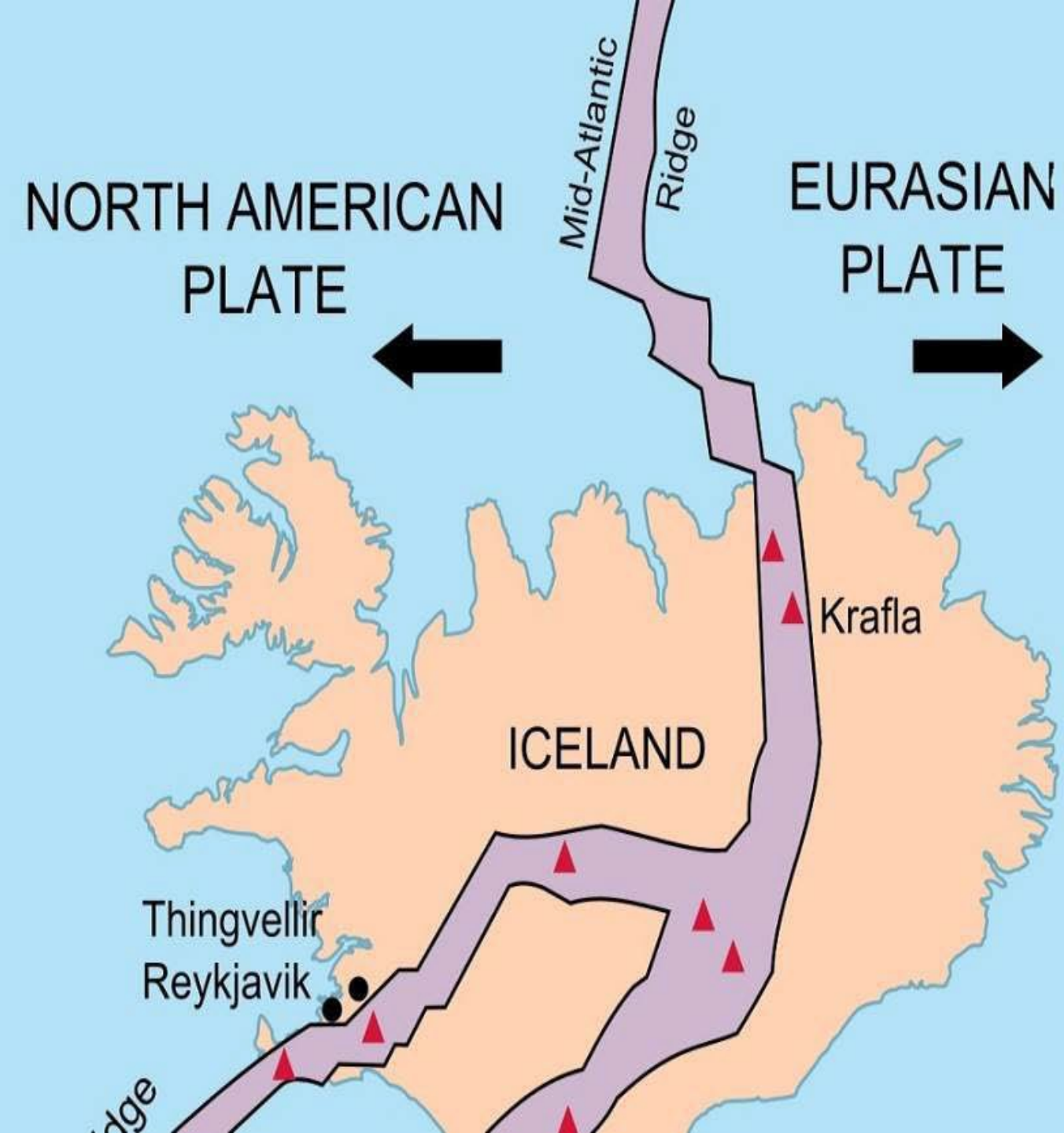
# Sea Floor Spreading



# Sea Floor Age





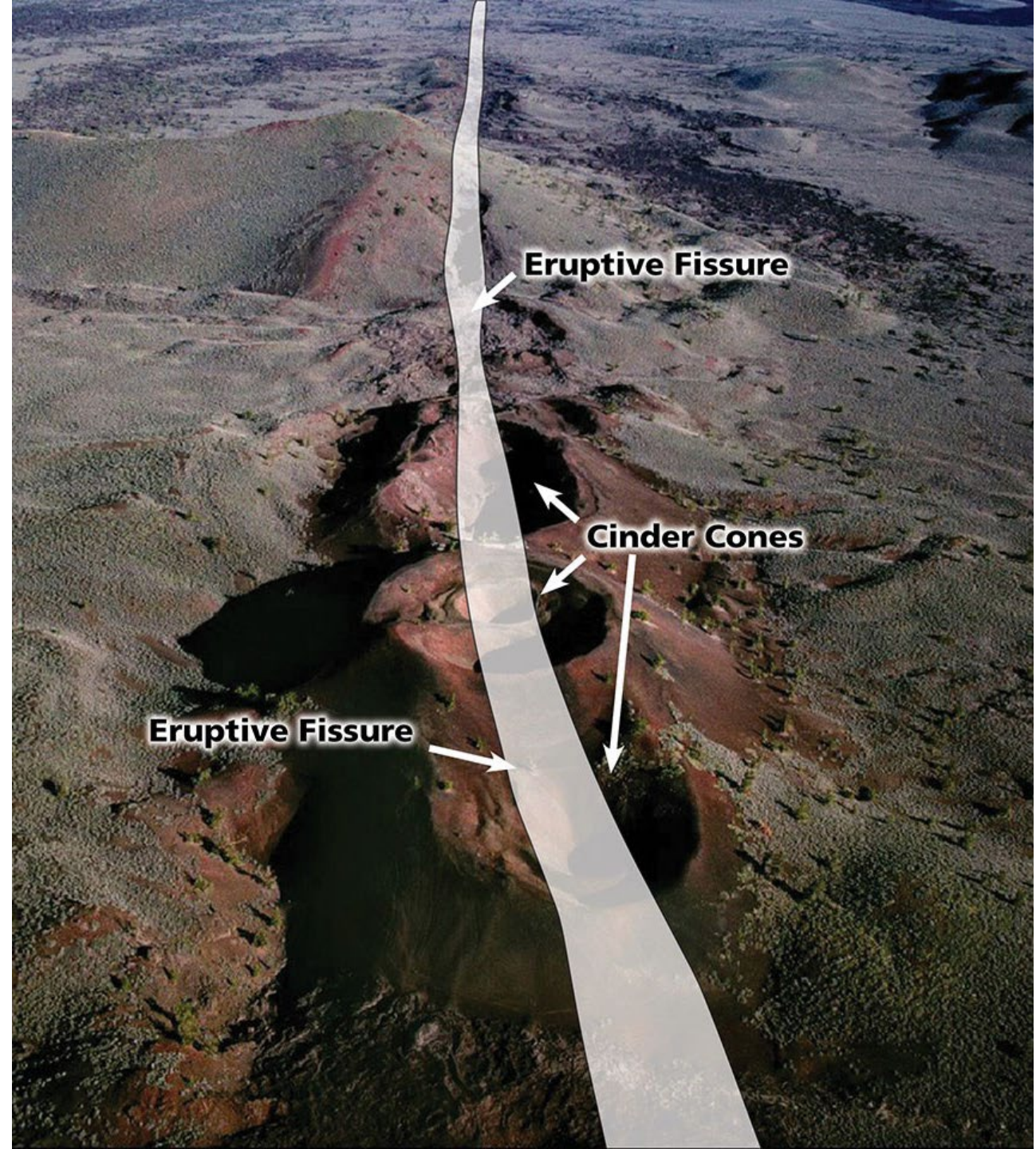
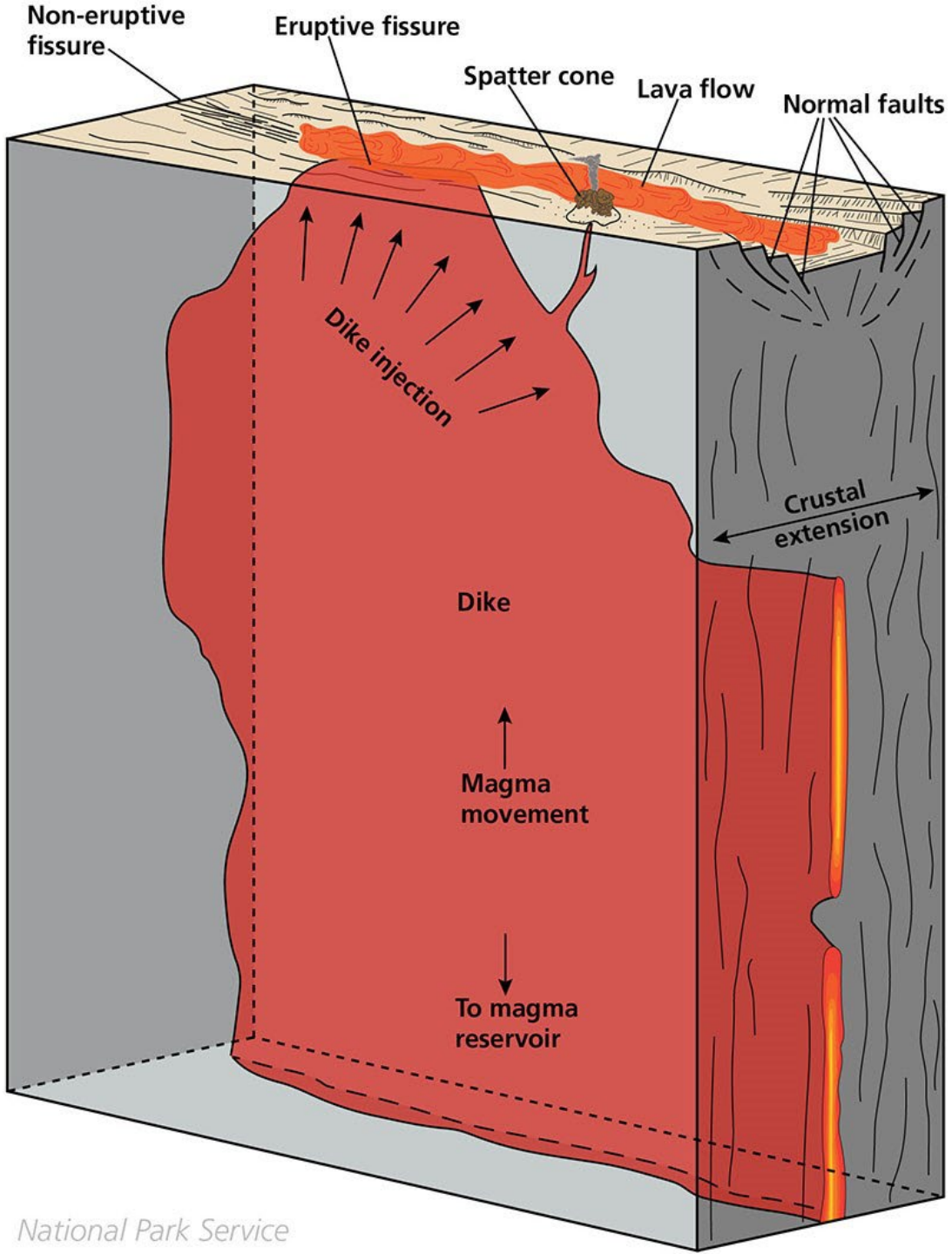




Þingvellir/Thingvellir





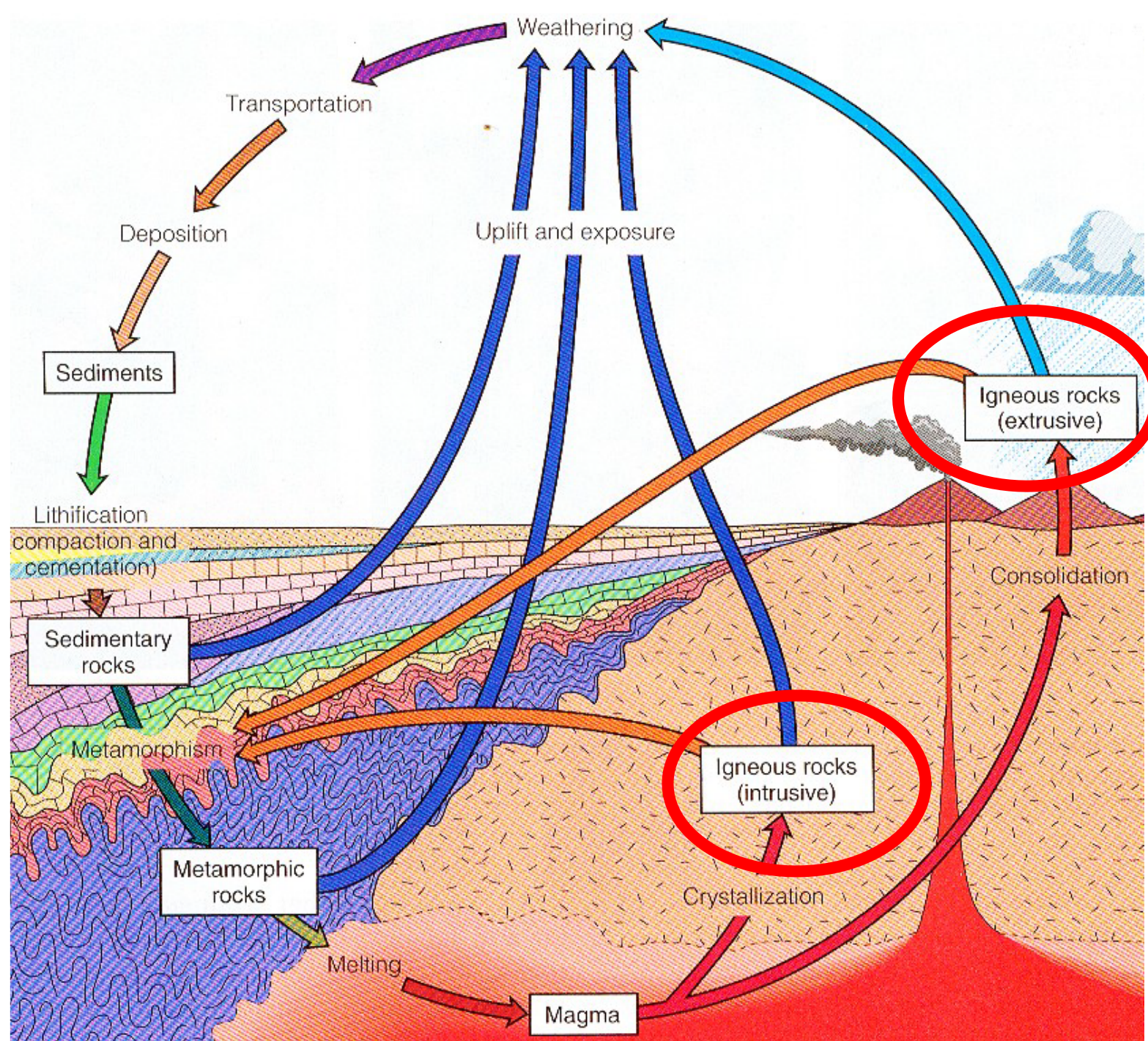




# Igneous Rock

Magma Vs. Lava

*Intrusive Vs Extrusive*



Extrusive

VERSUS

Intrusive

Volcano erupting  
rhyolitic melt.

Volcano erupting  
basaltic melt.

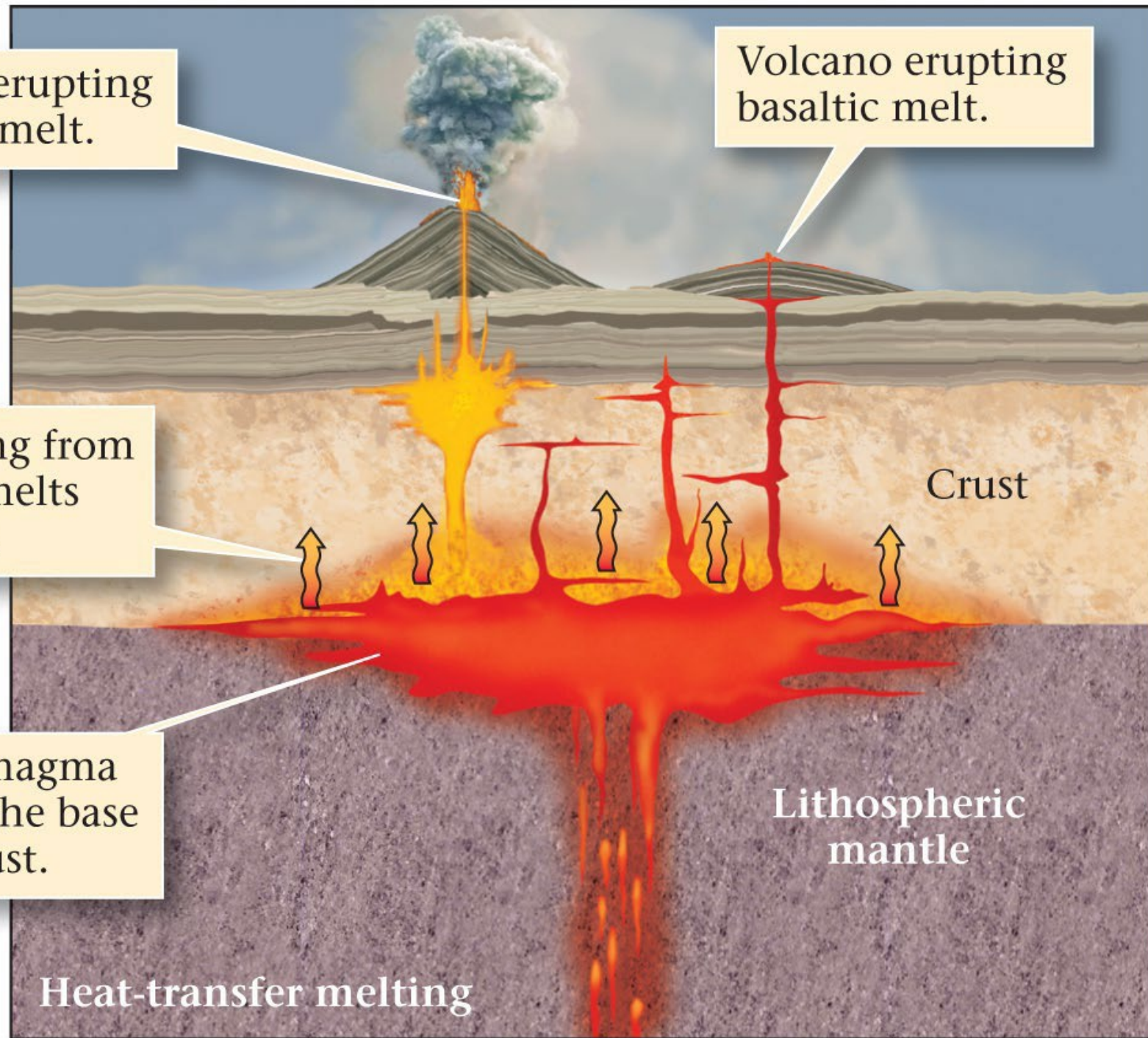
Heat rising from  
magma melts  
the crust.

Basaltic magma  
pools at the base  
of the crust.

Heat-transfer melting

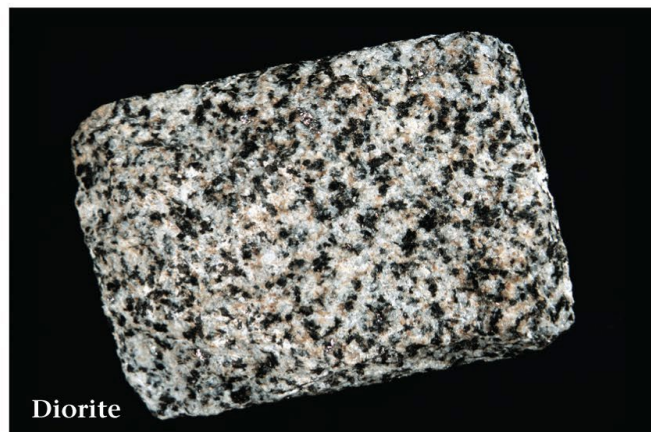
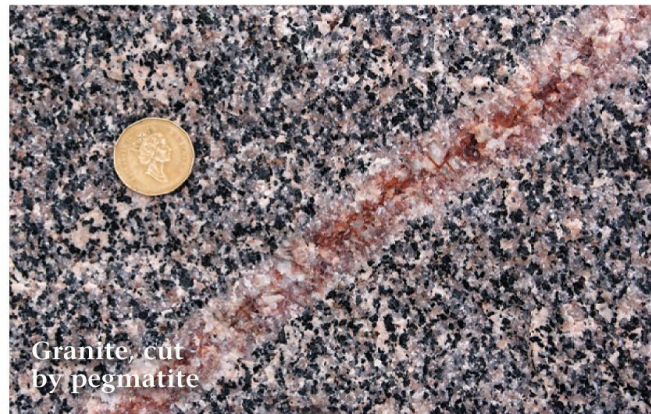
Crust

Lithospheric  
mantle



Fine grained

Coarse grained



Felsic



Increasing silica content

Mafic

Silicic

Intermediate

Mafic

Fine

Coarse

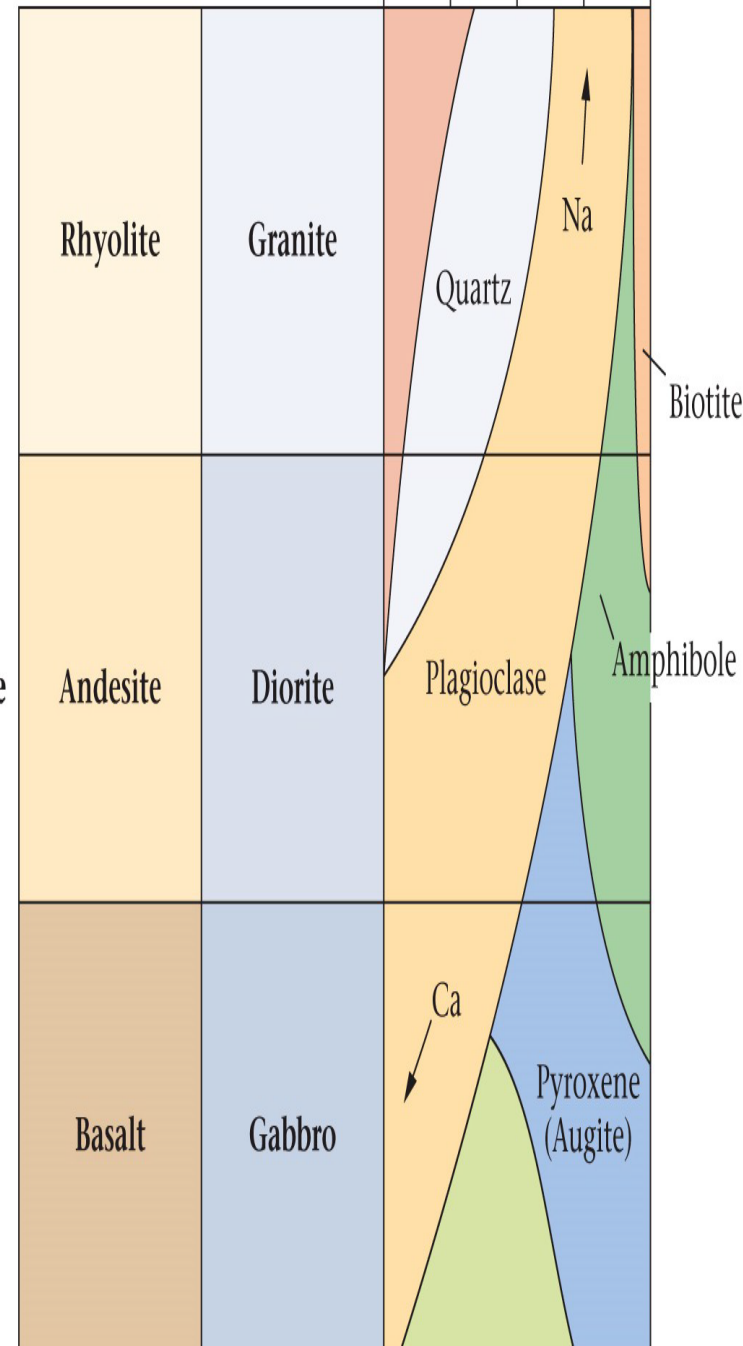
0

25

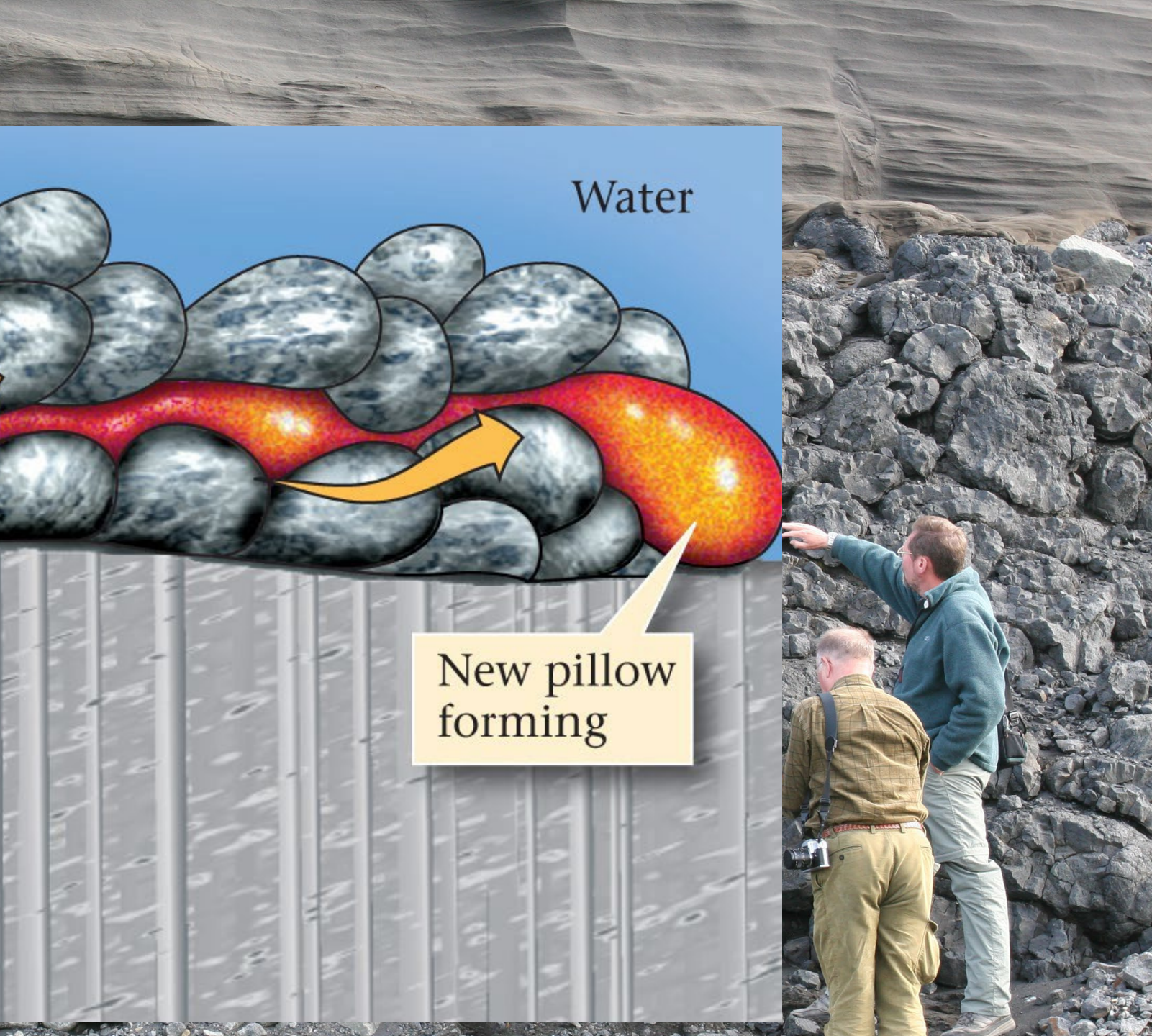
50

75

100







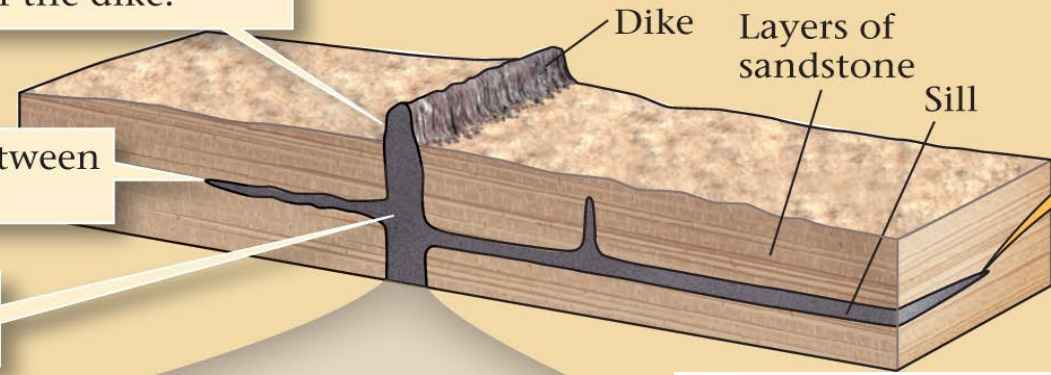
Water

New pillow forming

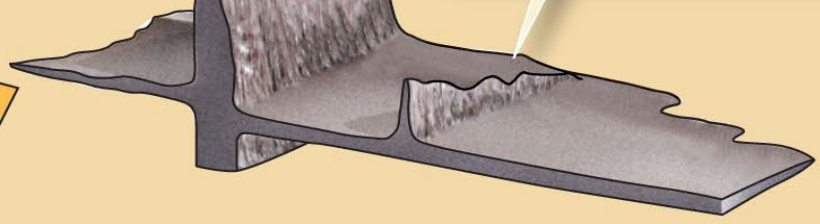
Erosion has removed part of the dike.

Sill pushes between layers of rock.

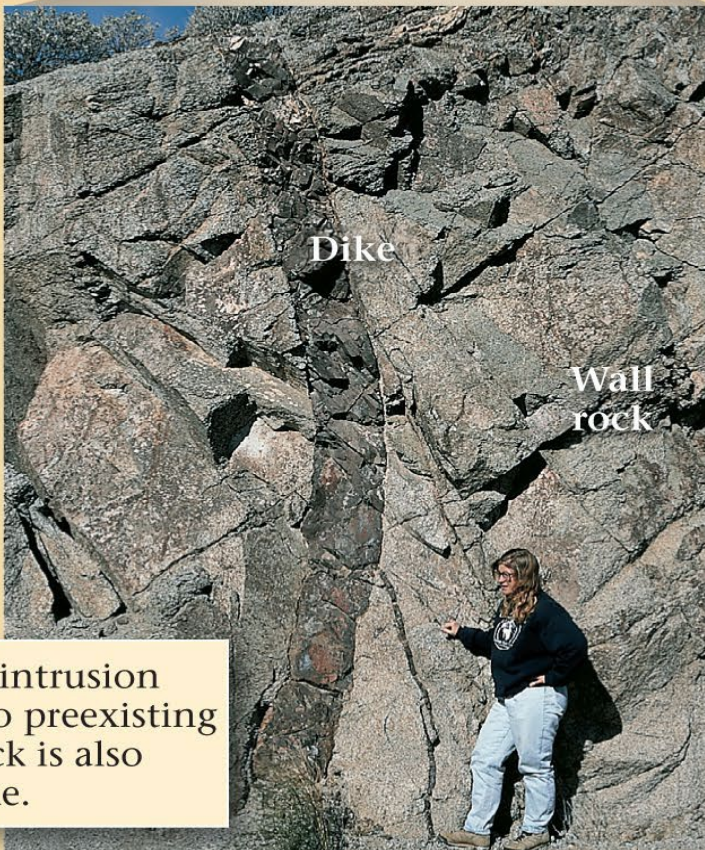
Dike cuts across layers.



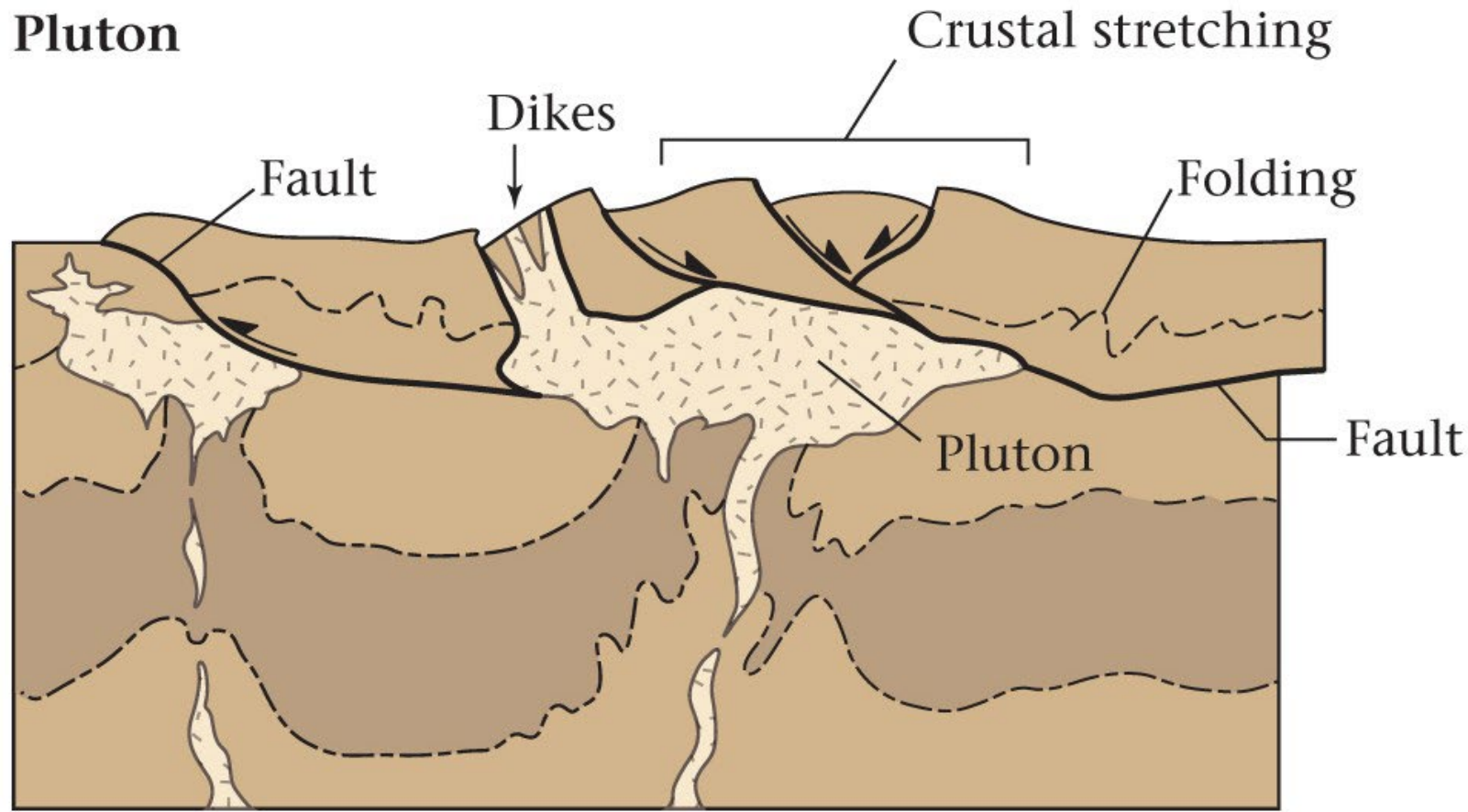
If all the sandstone were removed, the intrusions would look like this (before erosion).

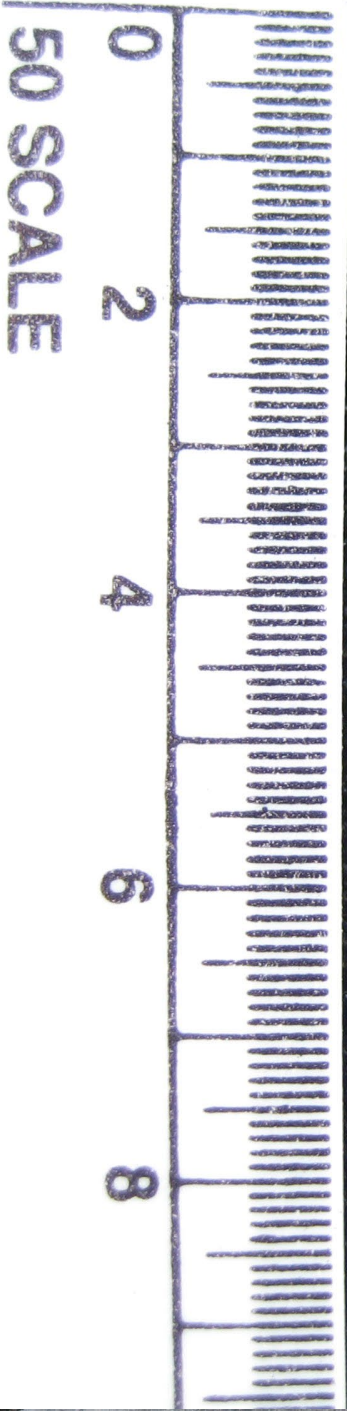


(a)



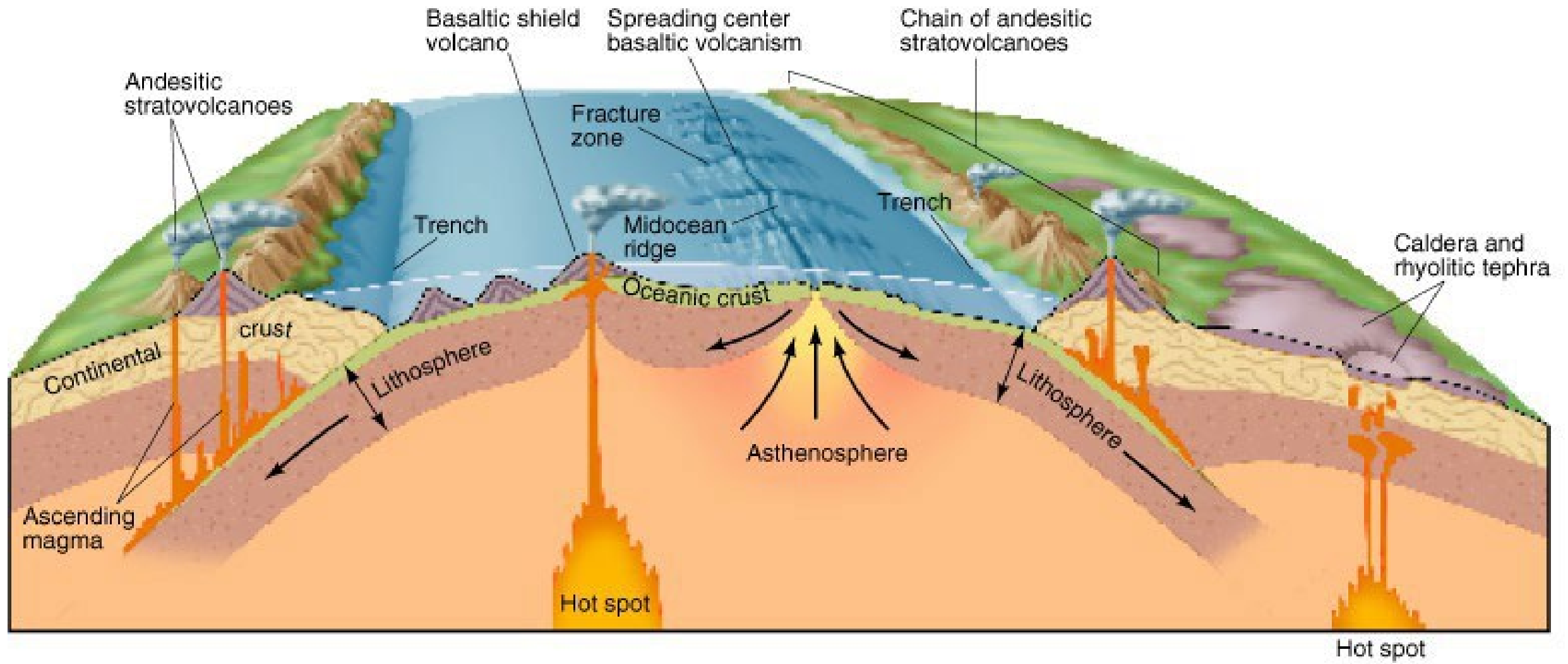
A wall-like intrusion cutting into preexisting igneous rock is also called a dike.





# 'Gentle' activity

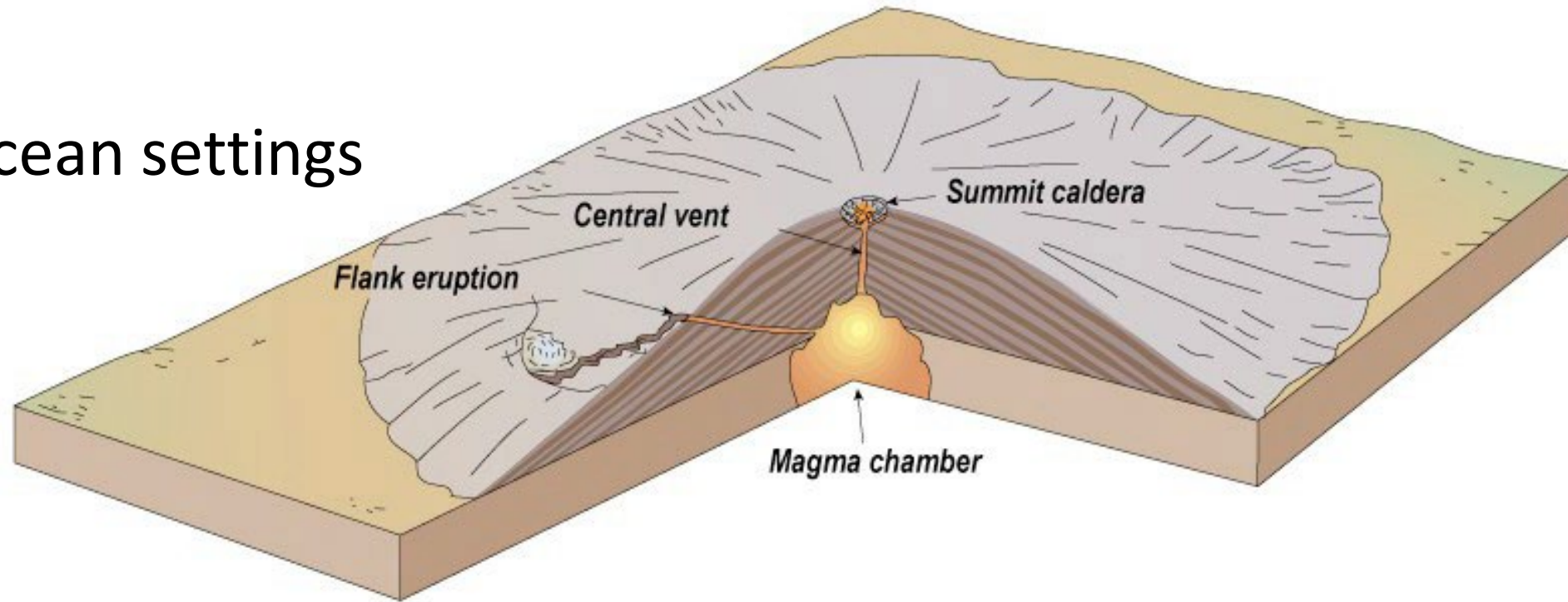
# Explosive activity





# Shield Volcano

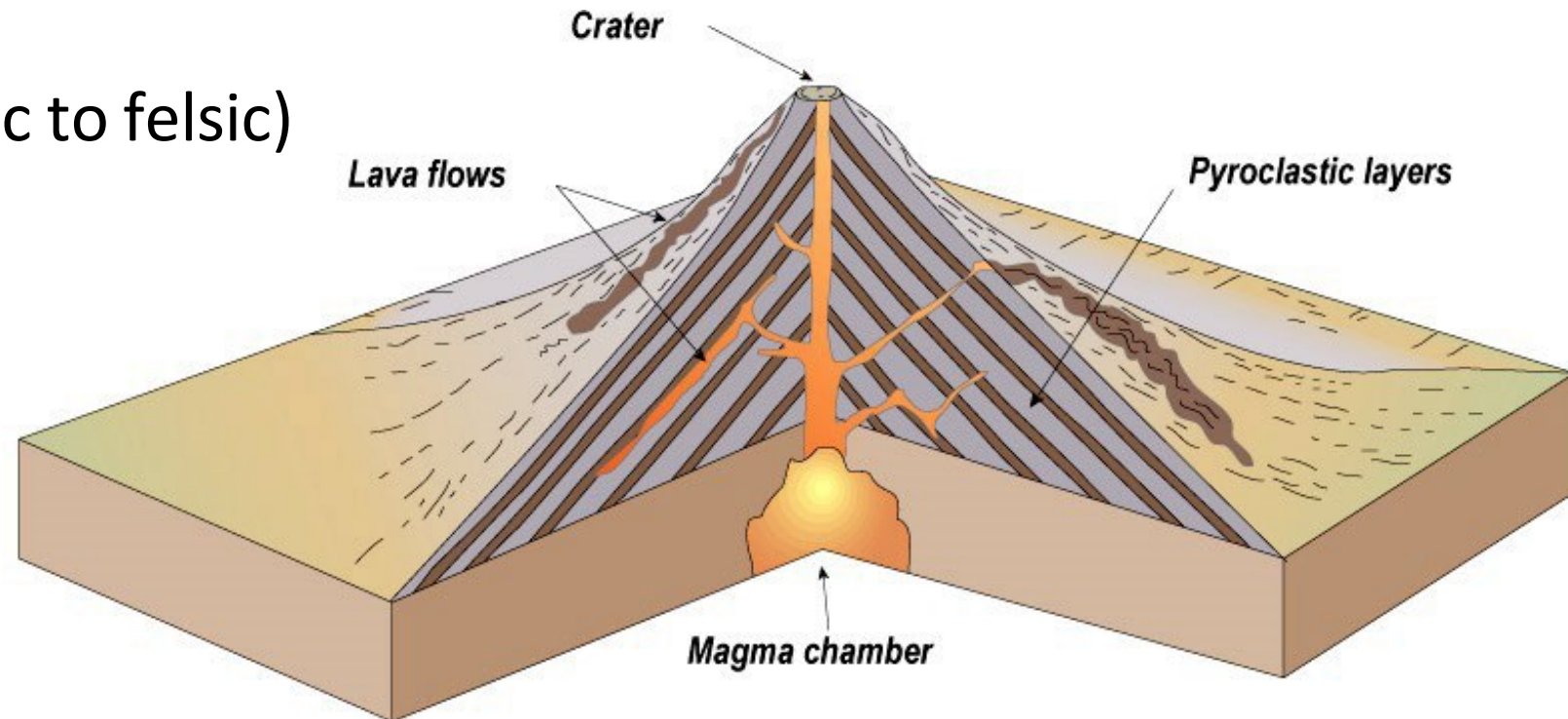
- Large
- Basaltic
- Gentle slopes
- Common in ocean settings
  - Iceland
  - Hawaii
  - Galapagos



(b) Shield volcano

# Strato or Composite Volcanoes

- Stratovolcanoes
  - Composite cones
- Mixed composition (basaltic to felsic)
- Steep slopes
- Thousands of feet high
- Beautiful areas
  - Mount Hekla
  - Mount Eyjafjallajökull
  - Mount Vesuvius
  - Mount Rainier
  - Mount St. Helens



(d) Composite volcano

# Lava Chemistry

- Mafic
- Intermediate
- Felsic
- Lava Viscosity



# Viscosity & Explosions

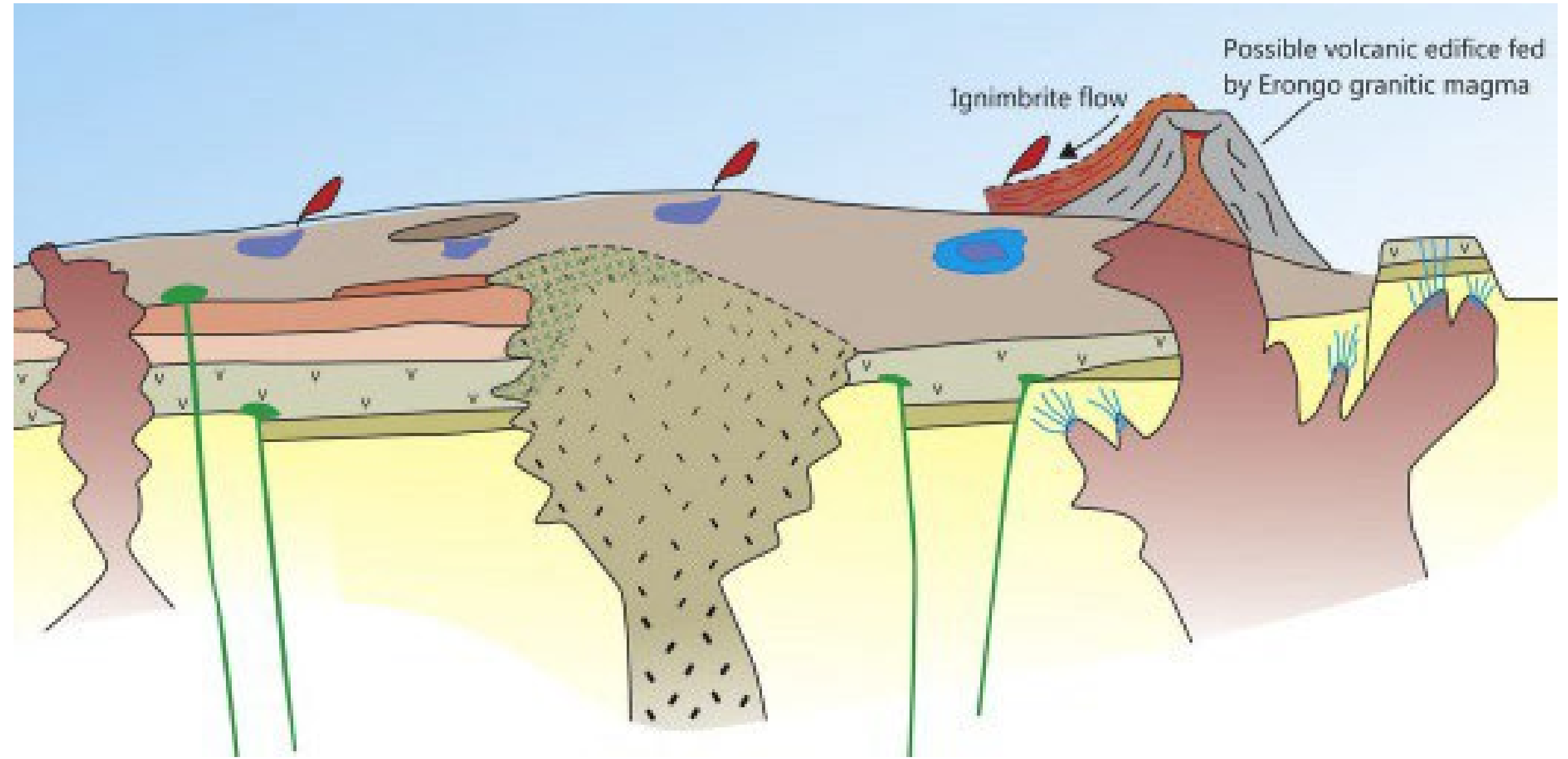
- Low viscosity = Small explosive eruptions
- High viscosity = Highly explosive eruptions



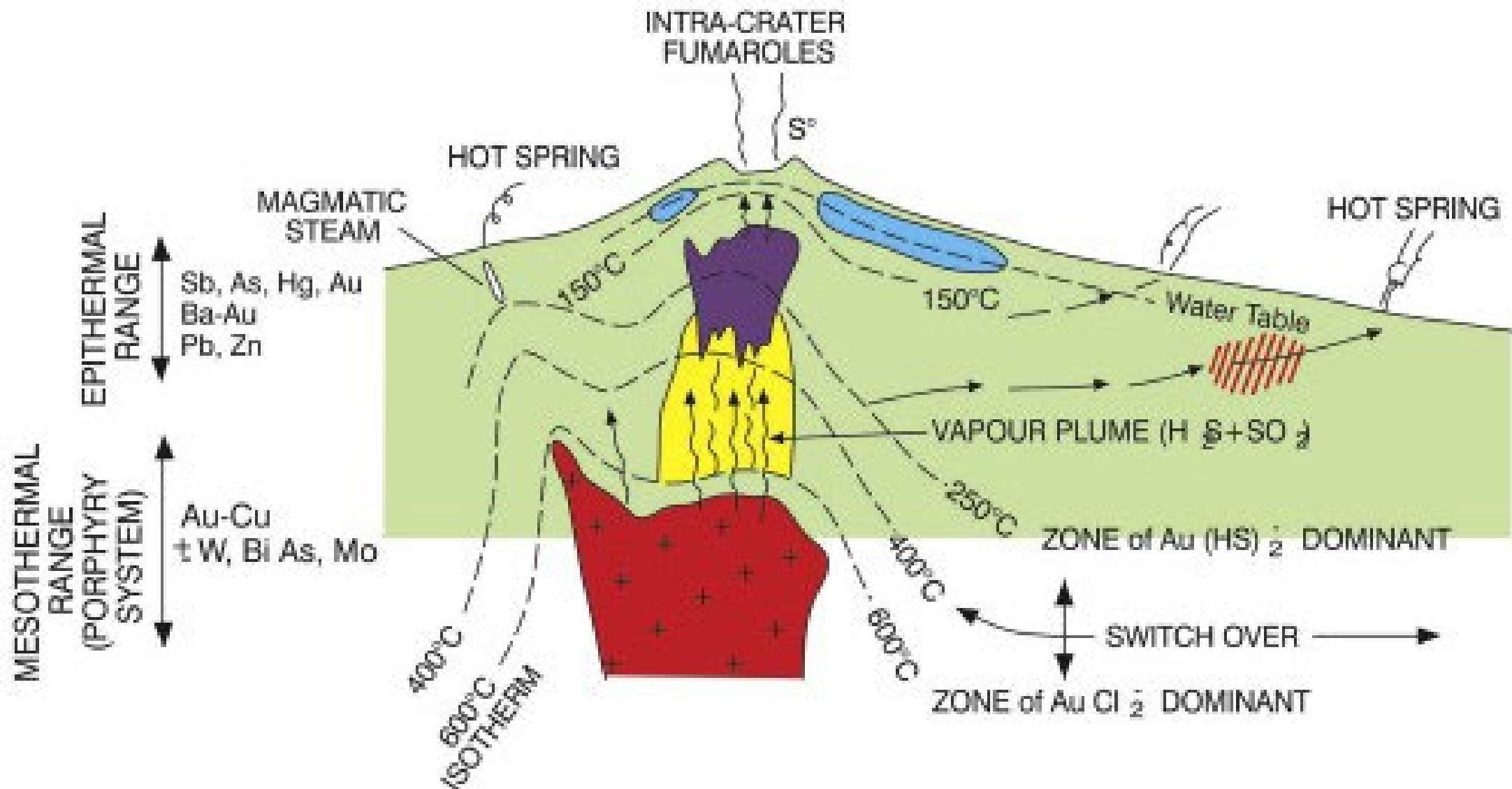
# Viscosity Vs. Temperature

- High temperature magma = Low viscosity
  - Hot spots, Mid-ocean ridges, .....
- Low temperature magma = High viscosity
  - Beneath continents

# Hydrothermal Pools



# B



- Steam heated acid sulphate zone
- Magmatic-Hydrothermal acid sulphate zone

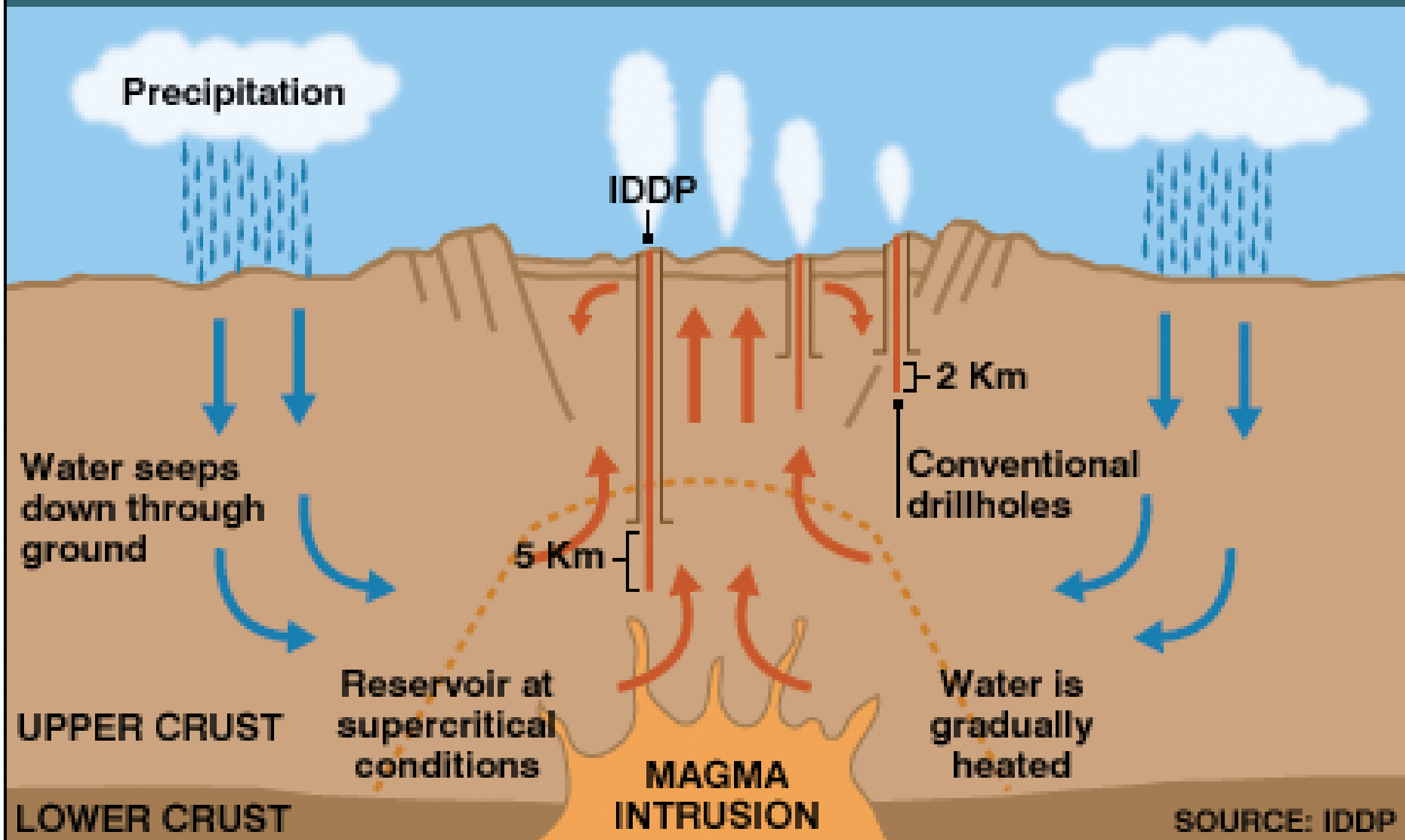
- Magma
- Adularia-sericite zone





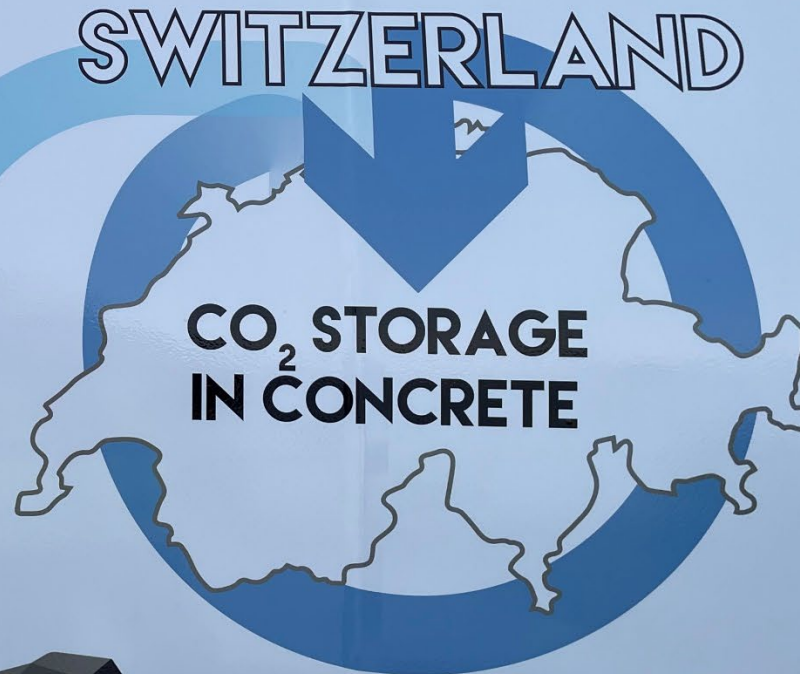


# ICELAND DEEP DRILLING PROJECT



SOURCE: IDDP

# EXPLORING CO<sub>2</sub> MANAGEMENT SOLUTIONS



DEMO UP  CARMA

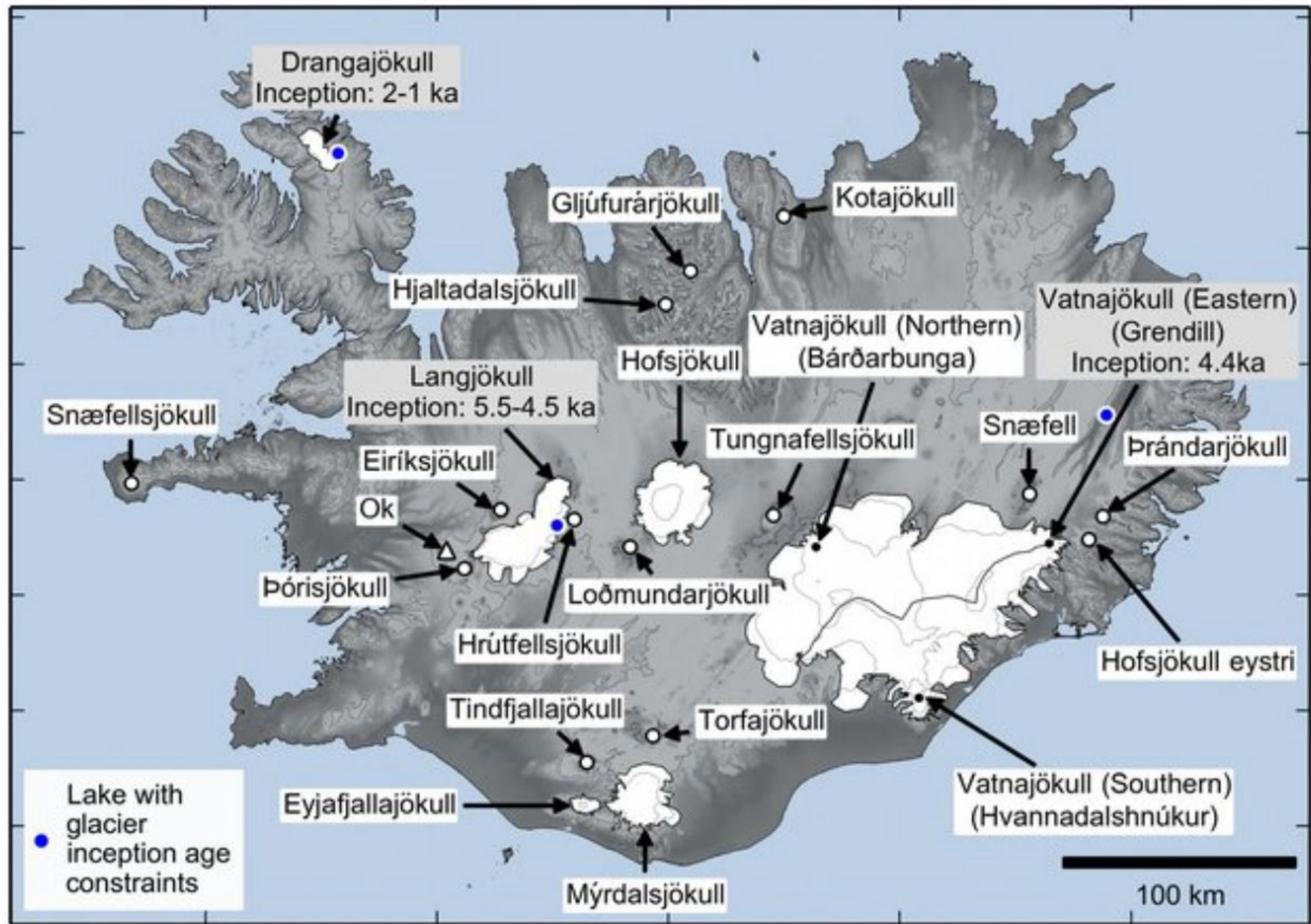
The logo for CARMA features a stylized blue 'C' with a black hexagonal shape inside it, and a blue arrow pointing upwards and to the right.



# Glacial Iceland



# Glaciers



# Ice Product



Snow

Firn

Ice

# Glaciers

A body of ice, firn, and snow that is,  
On land and  
On the move!

# Basic types of Glaciers

- Continental
- Alpine
- Piedmont

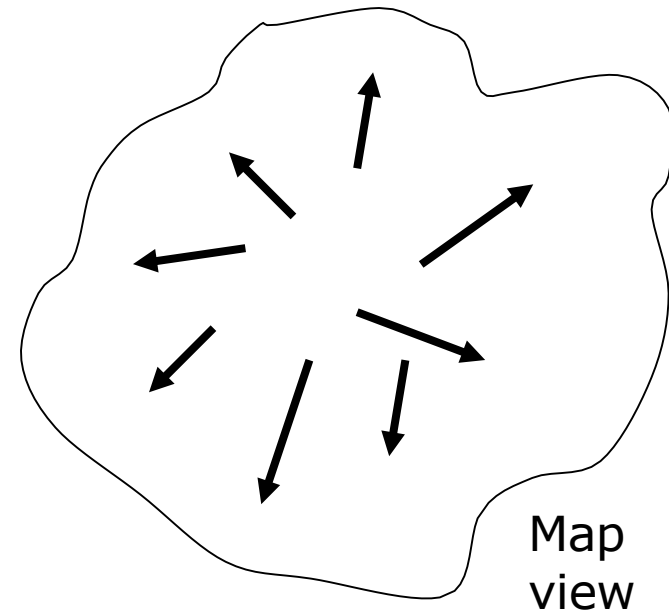
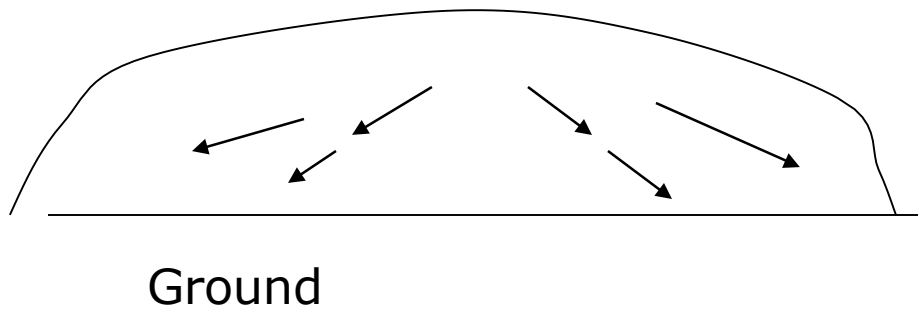


# Ice sheets and caps

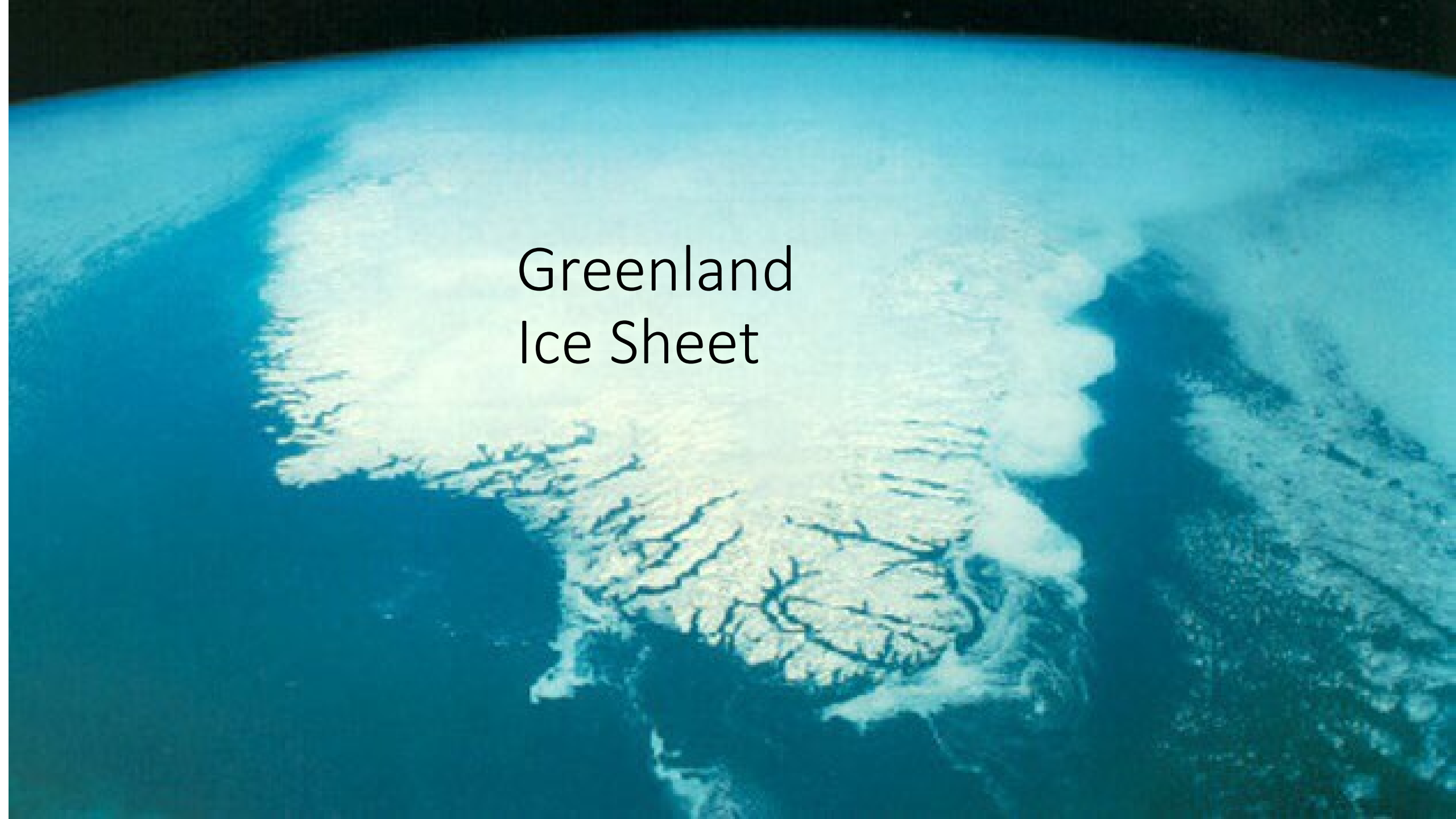
- Massive, unconfined, bodies of snow, firn, and ice
  - Ice sheets are larger than ice caps
- Extremely sensitive to climatic change

# Morphology

## 1. Continuous sheets; Ice sheets (i.e. continental glaciers)



Ice caps are much smaller!!

A satellite photograph of the Greenland Ice Sheet, showing the vast expanse of white ice covering the island. The ice sheet is surrounded by dark blue ocean water. The text "Greenland Ice Sheet" is overlaid in the center of the image.

# Greenland Ice Sheet

# Vatnajökull



# Jökulsárlón







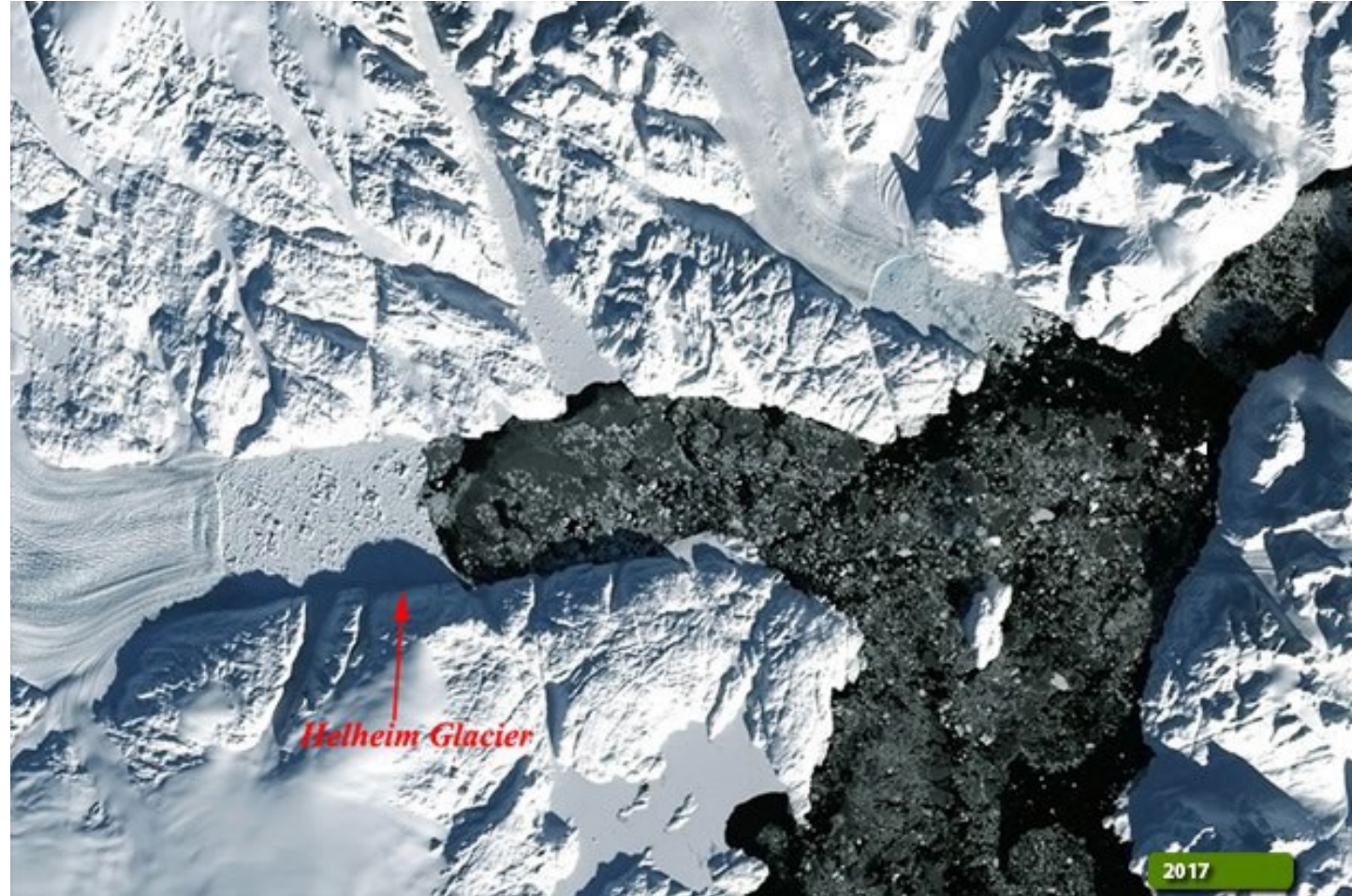
JAKI

[www.jokulsarlon.is](http://www.jokulsarlon.is)



# Malign to Benevolent Glaciers

- Norse Mythology
- Helheim Glacier
  - ‘Relm of Hell’ ‘Hidden Place’
- The word Hell, Helviti in Icelandic is deeply rooted in our language origins Proto-Germanic to Proto-Indo-European
- Glaciers with ‘souls’, indigenous languages use verbs to refer to glaciers, plants... ‘Grammar of animacy’ R.W.K.



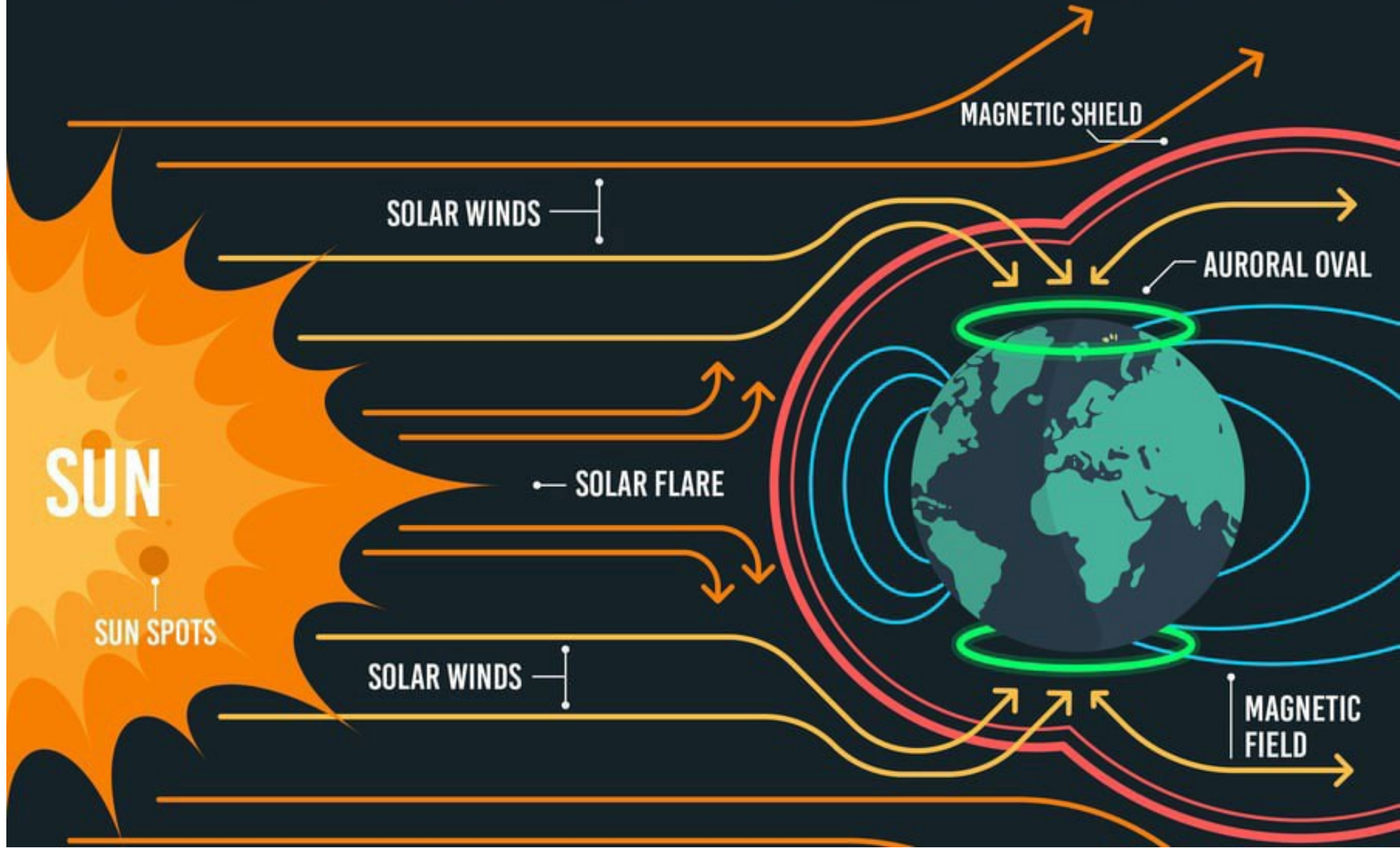


# Northern Lights

Auroras occur when charged particles (electrons and protons) collide with gases in Earth's upper atmosphere.

Producing tiny flashes that fill the sky with colorful light.

## WHAT CAUSES THE NORTHERN LIGHTS?



3<sup>rd</sup> Night - Northern lights hunting













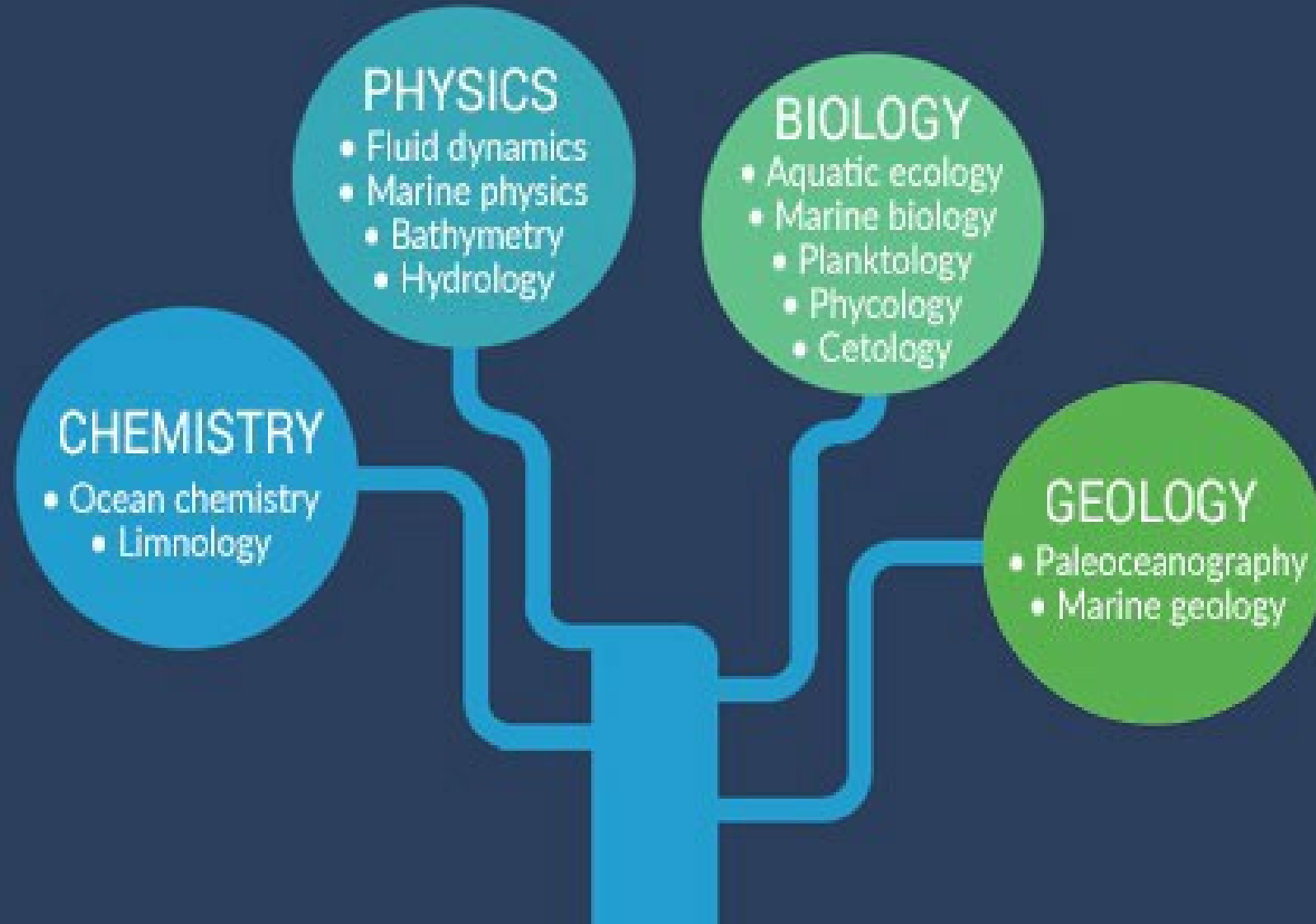


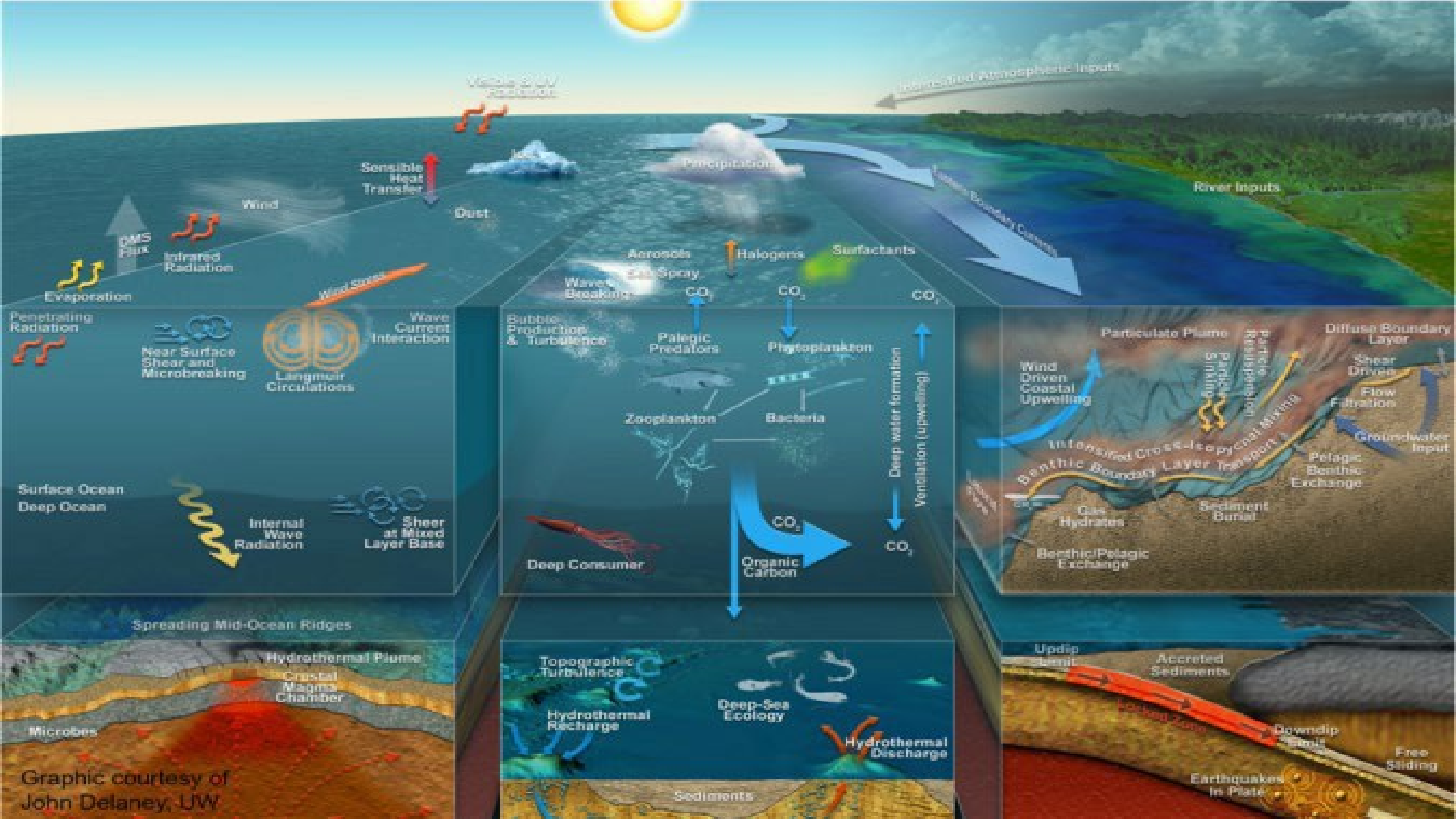


A wide-angle photograph of a beach at sunset. The sky is filled with vibrant, streaked clouds in shades of orange, red, and yellow, with a bright sun low on the horizon. The ocean waves are breaking on the right side of the frame, creating white foam. The beach is dark and reflective, mirroring the colors of the sky. In the foreground, a large, dark, jagged rock sits on the sand. The overall mood is serene and majestic.

# Iceland Oceanography

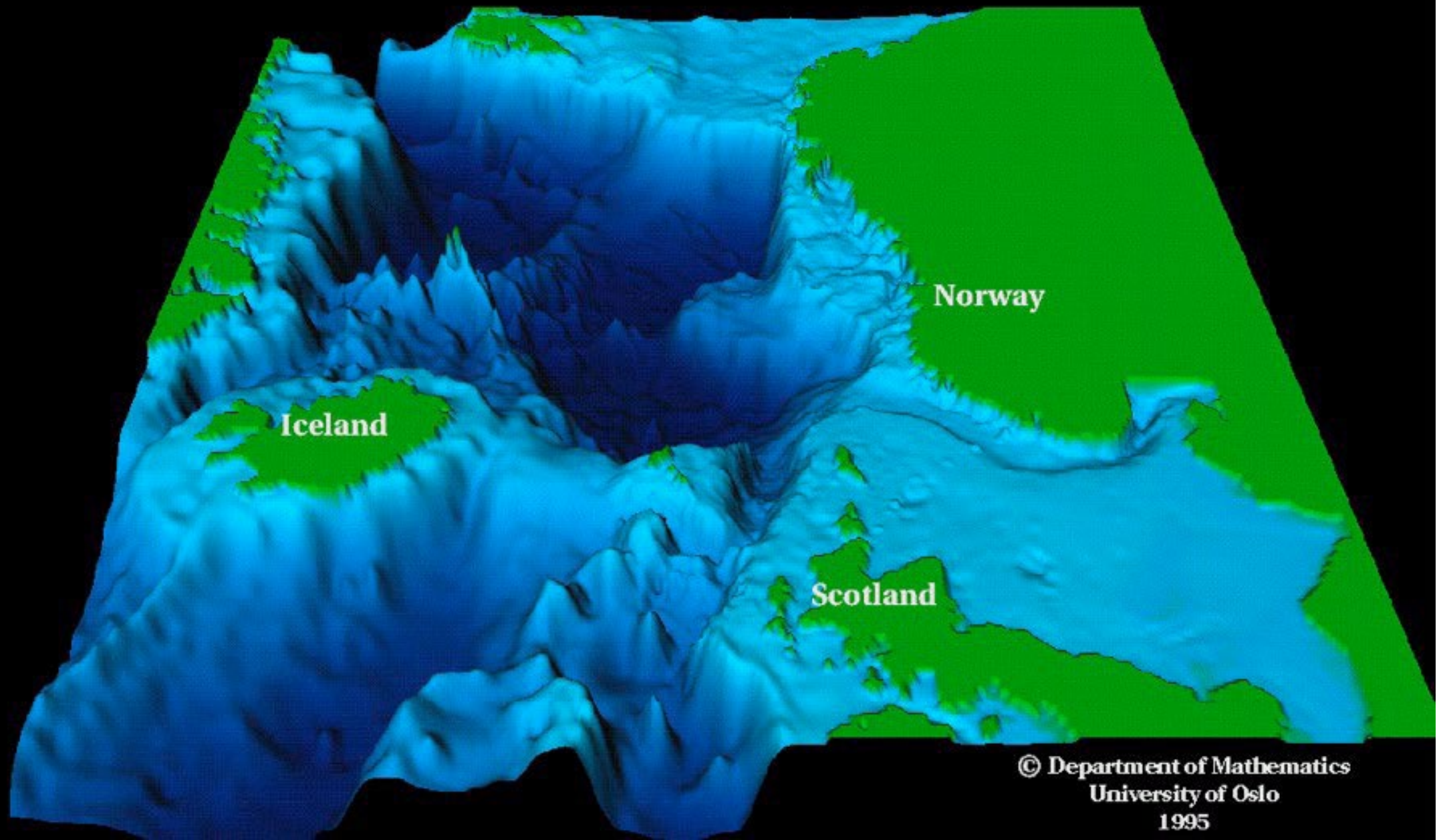
# BRANCHES OF OCEANOGRAPHY

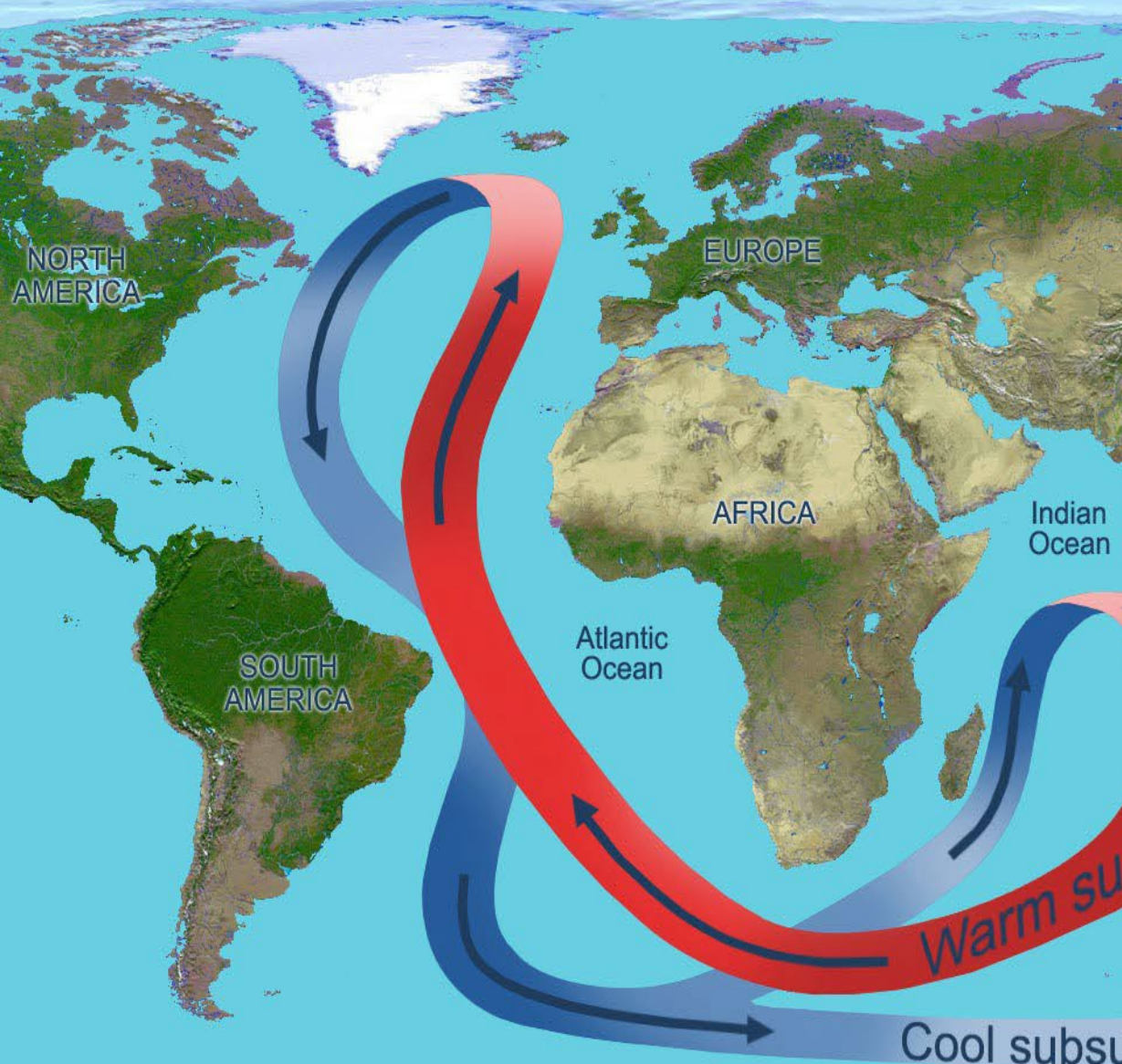




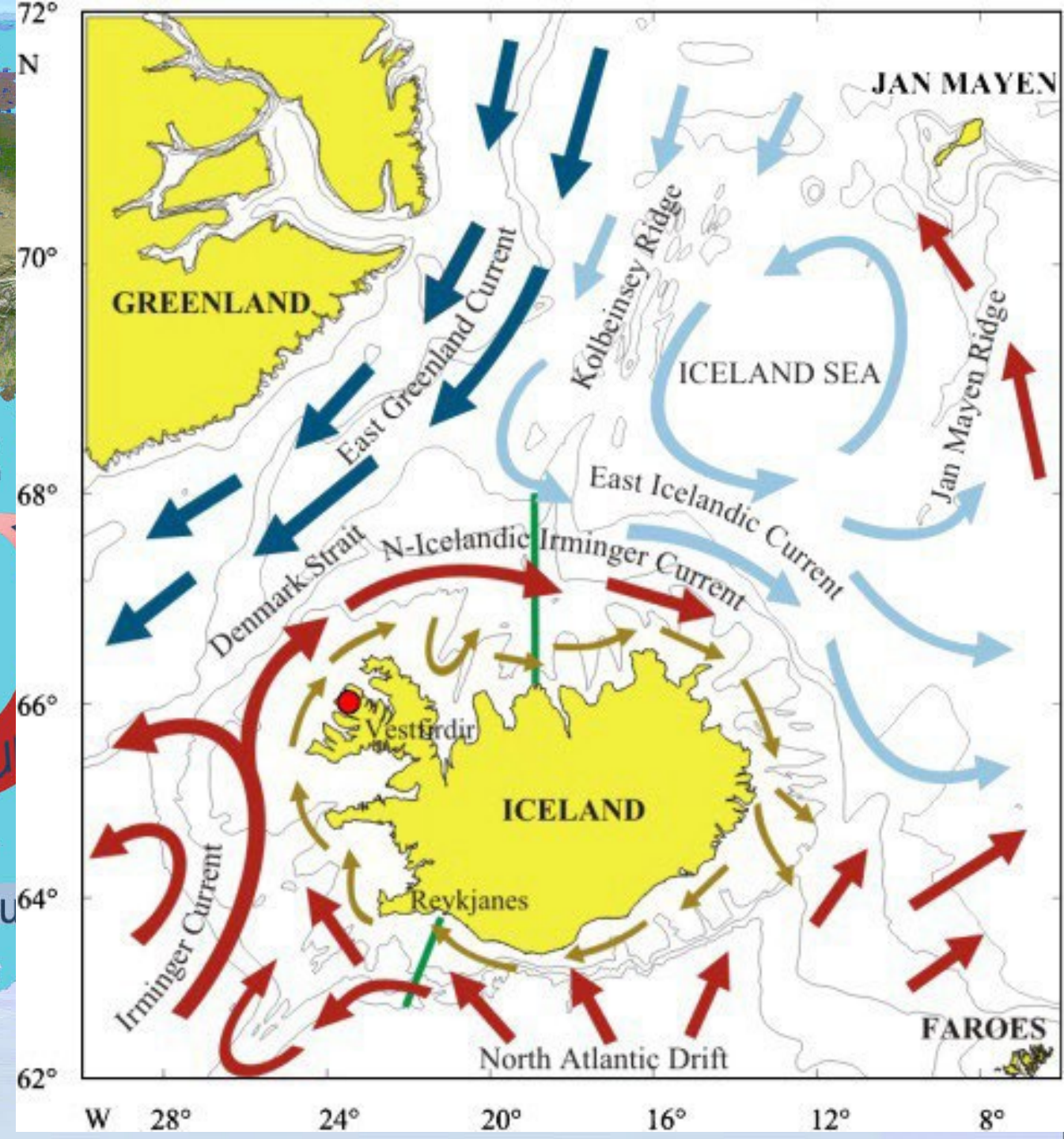
Graphic courtesy of John Delaney, UW

# Bathymetry Nordic Seas



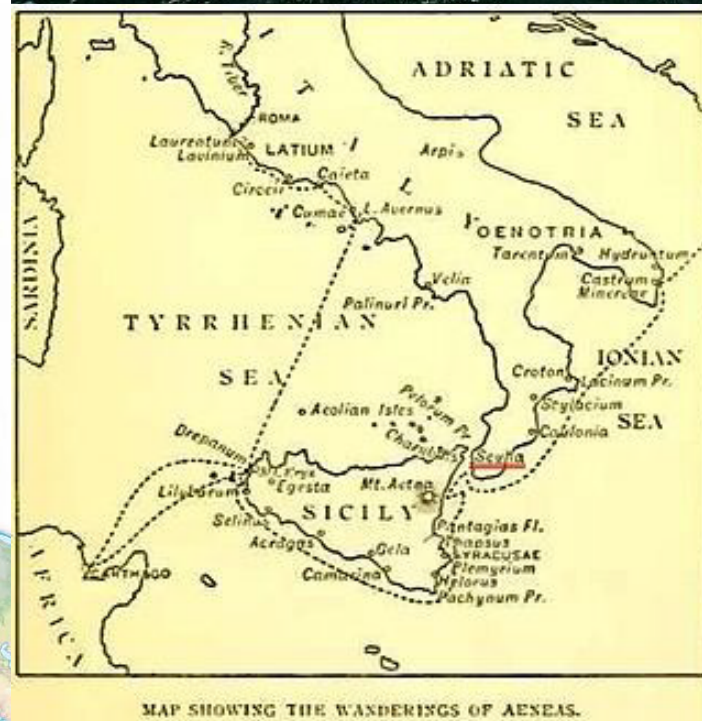


# Climate Change



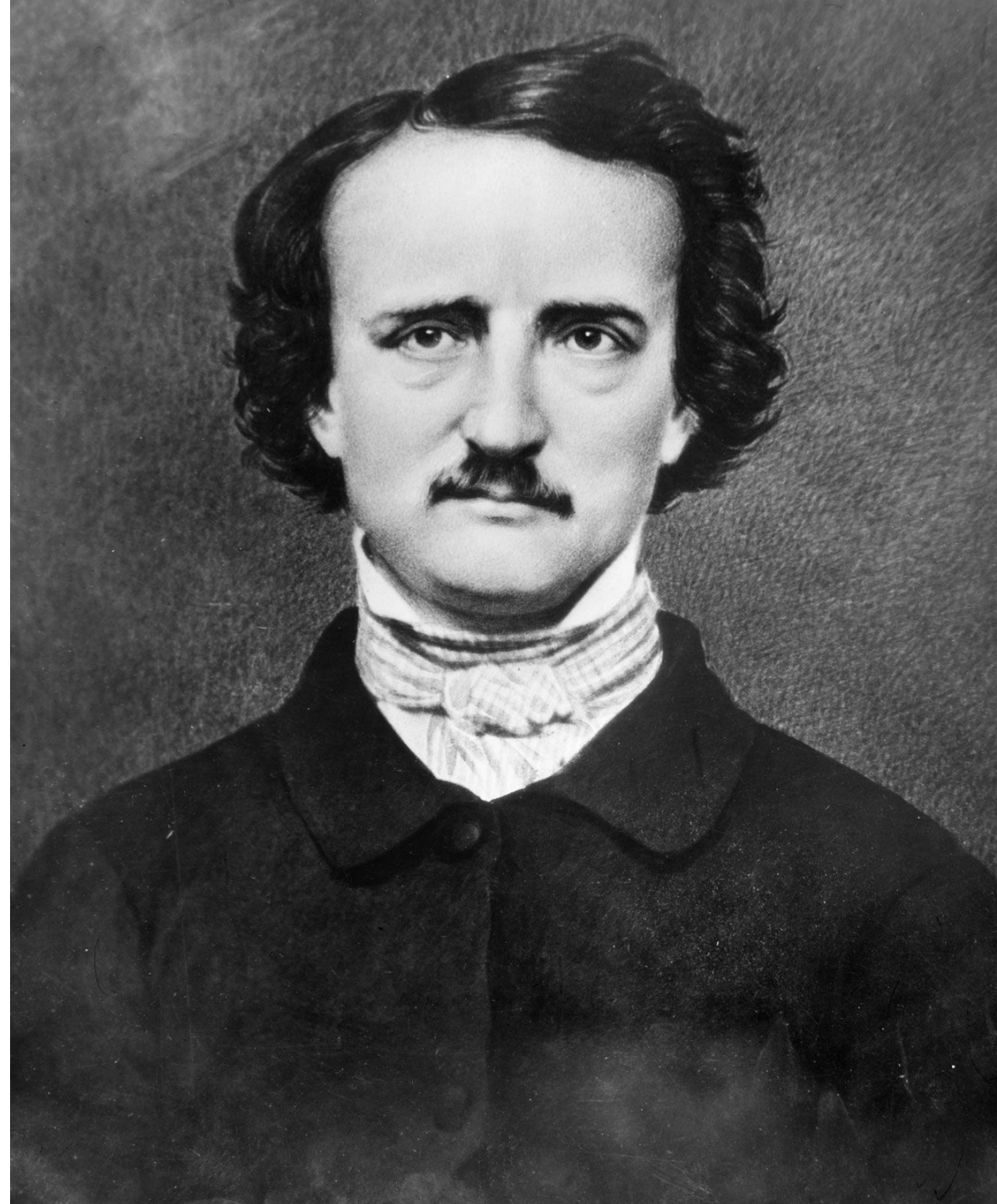
# Whirlpools

- Rapidly spinning water created by passing/apposing currents
- Examples
  - Maelstrom – Norway
  - Charybdis – Strait of Messina



# Maelstrom/Whirlpool

- Viking Stories
  - Mythologies
- Decent into the Maelstrom



# Prominent life

Codfish

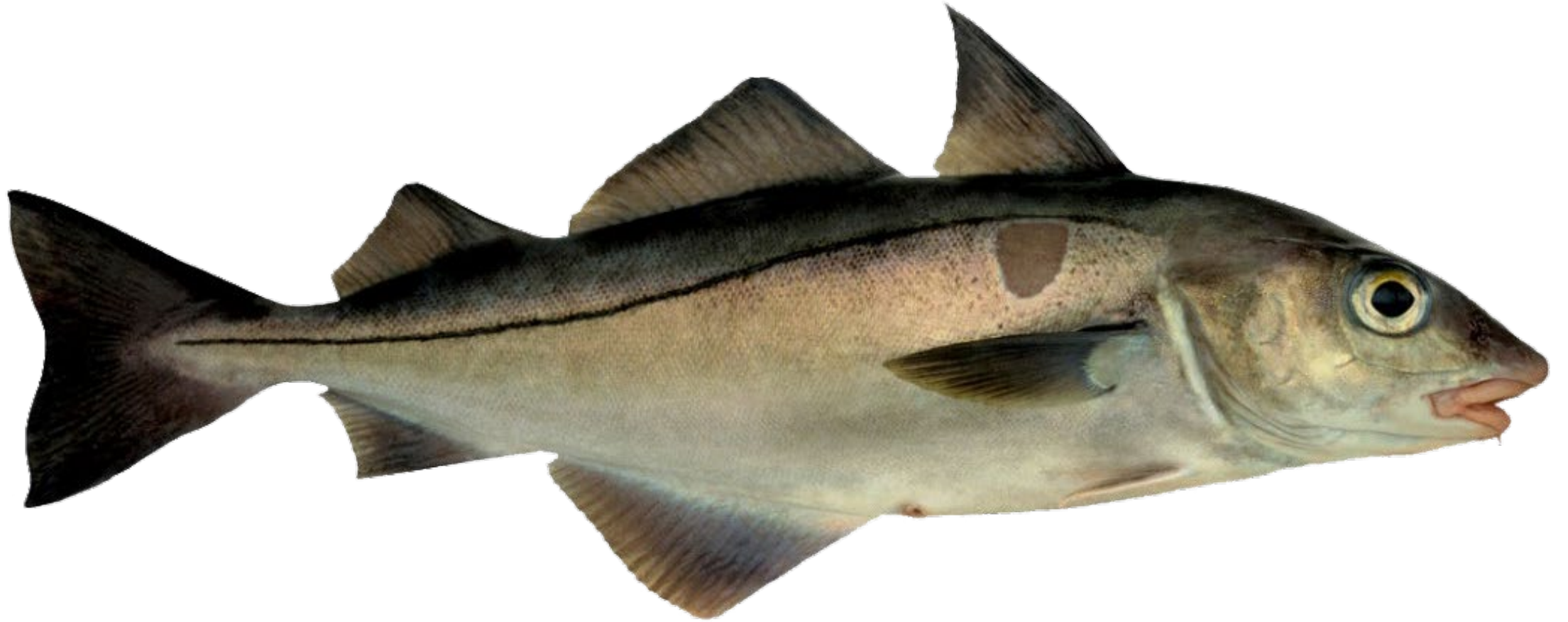




Messinn



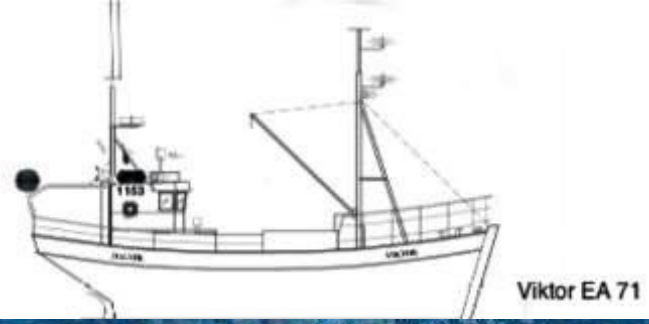
# Haddock

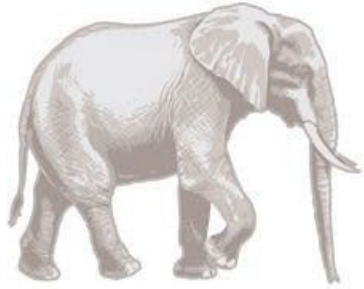
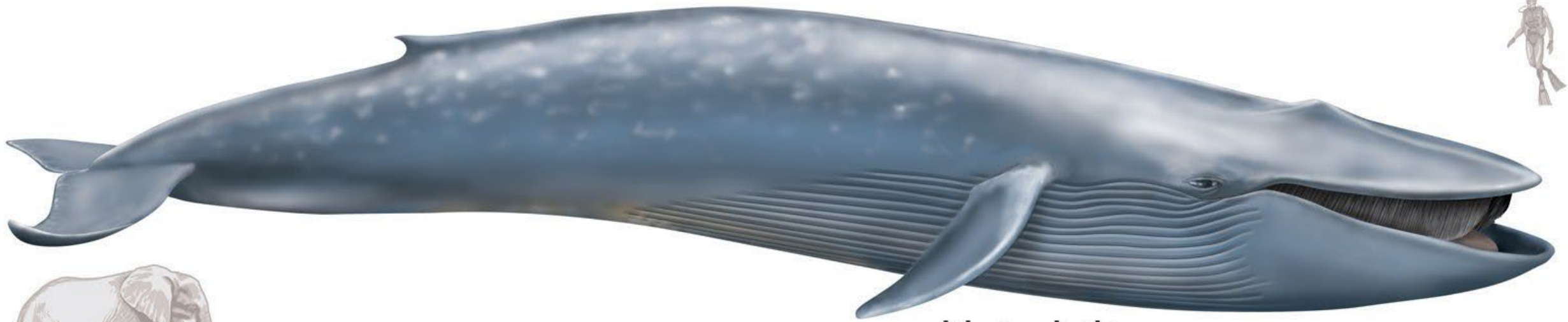


# Halibut



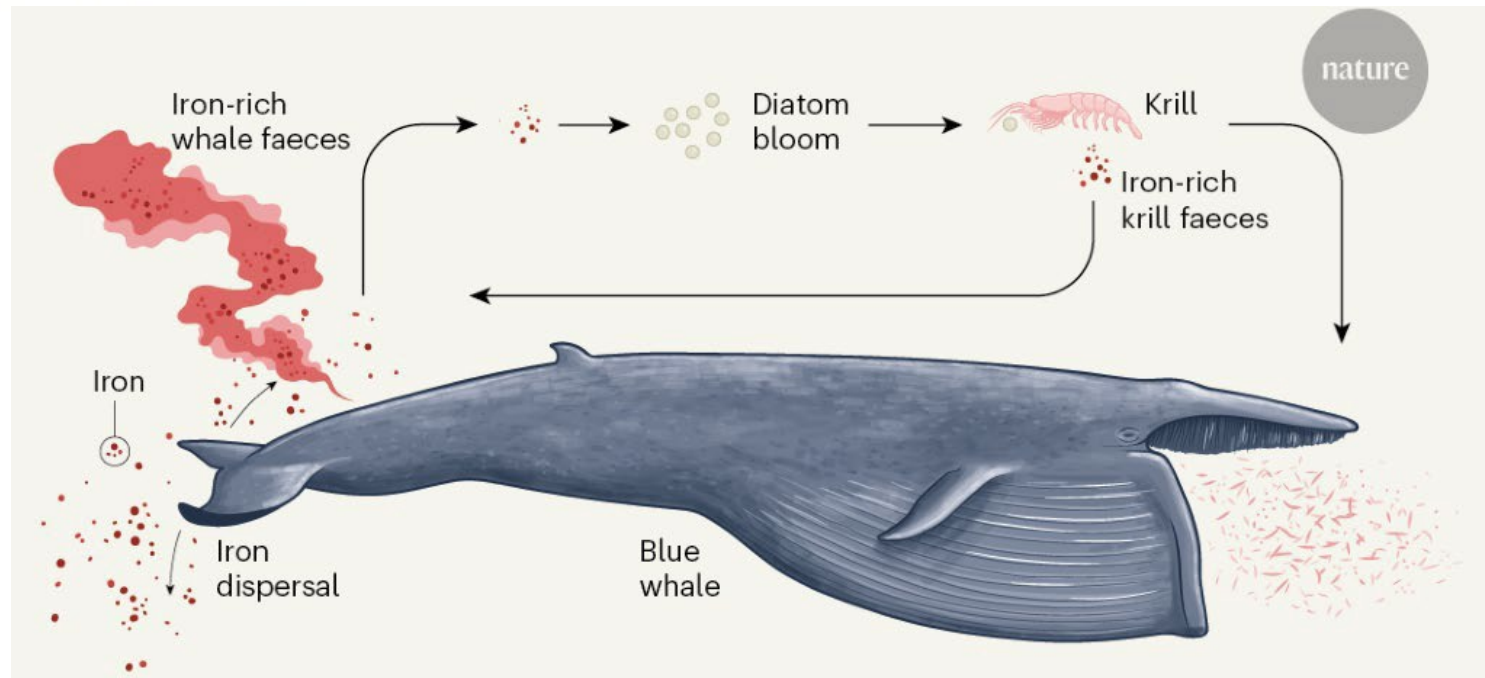
# Whales





3 metres  
9 feet

**blue whale**  
*(Balaenoptera musculus)*  
length 29.5 m (97 ft)



Encyclopædia Britannica, Inc.

# Walrus



# Puffin

- 'Sea Parrots'
- Spend most of their life at Sea, floating and swimming
- Carnivores
- Can flap wings 400/min and fly at 88km/hr, 55mph



# Icelandic Horse

