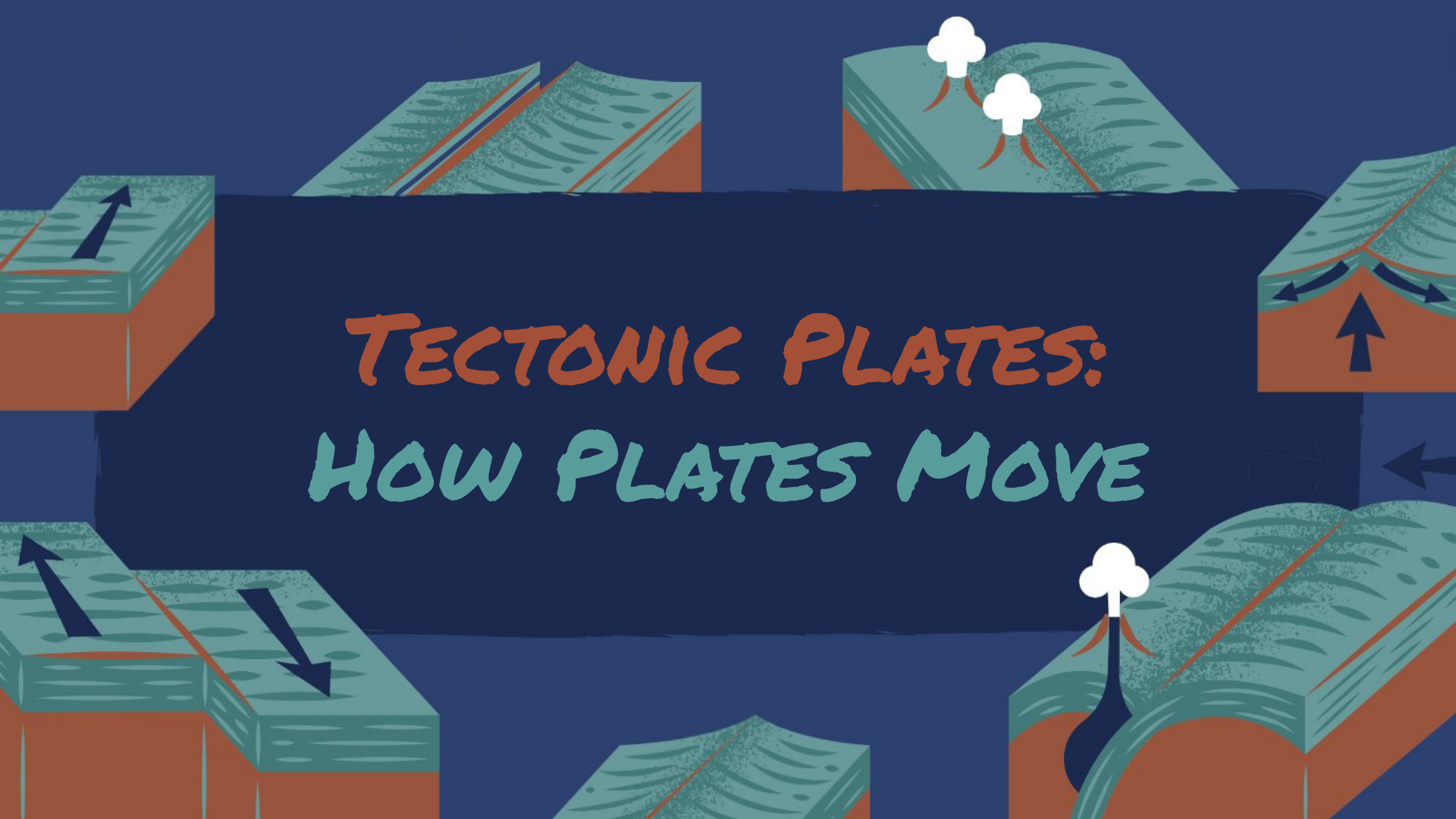

Tectonic Plates:
How Plates Move

NGSS Standards

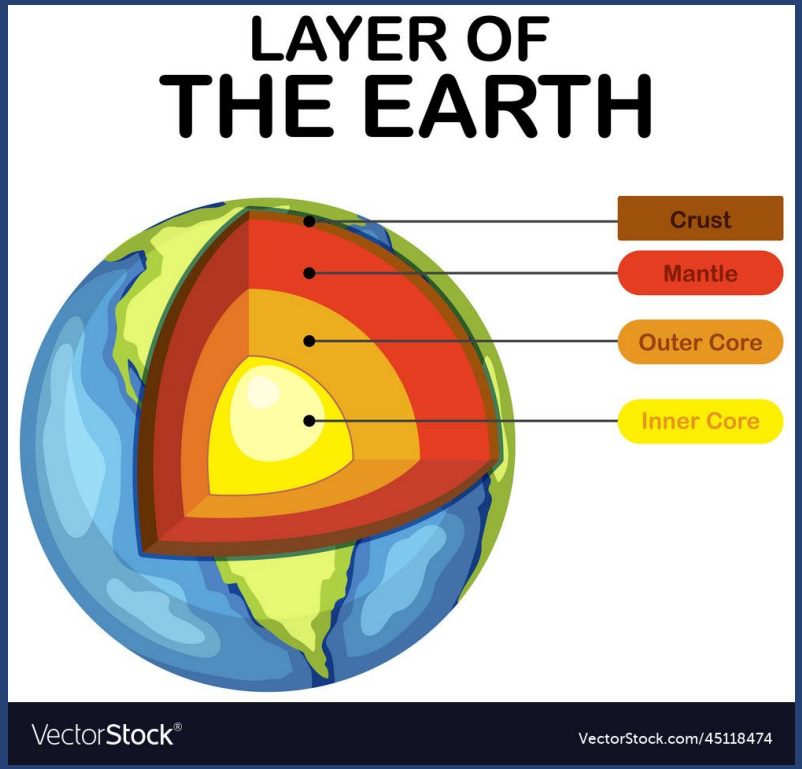
MS-ESS2-2.

- Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

MS-ESS3-2.

- Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

The Earth Has Layers



Layers of the Earth:

- Inner Core
- Outer Core
- Mantle
- Crust

The Earth Has Layers

- **Inner Core**
  - Solid
  - Made of Metals, mostly iron and nickel
- **Outer Core**
  - Liquid
  - Made of Metals, mostly iron and nickel

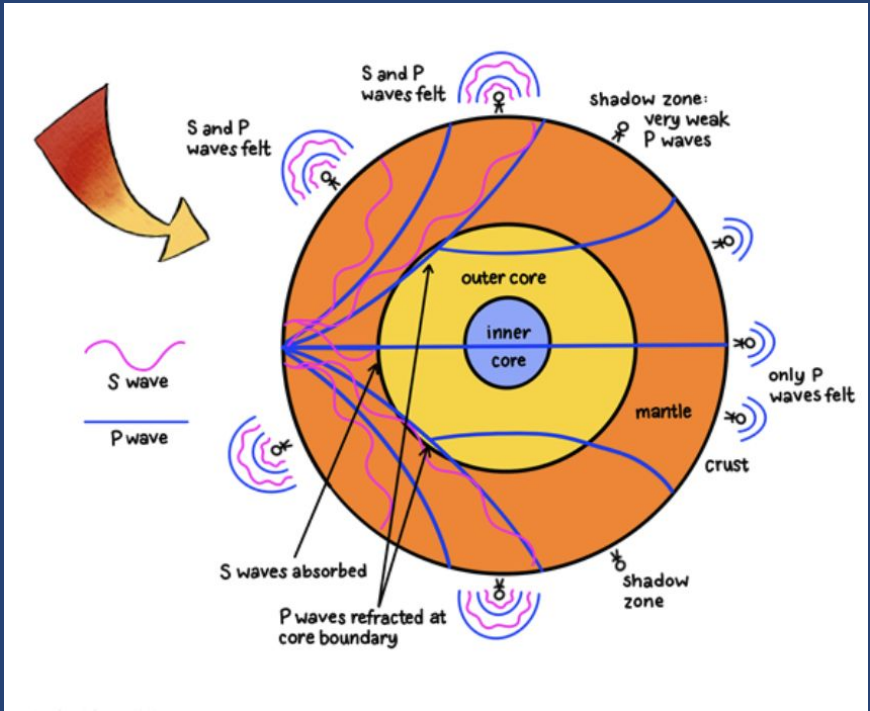
The movement of the inner core in the outer core causes the magnetic field around the Earth.

The Earth Has Layers

- **Mantle**
  - Flows in plastic-like layer
  - Made primarily of Silicon and Oxygen
- **Crust**
  - Rocky layer
  - Divided into oceanic and continental crusts.

The movement of the mantle below the crust causes the movement of tectonic plates.

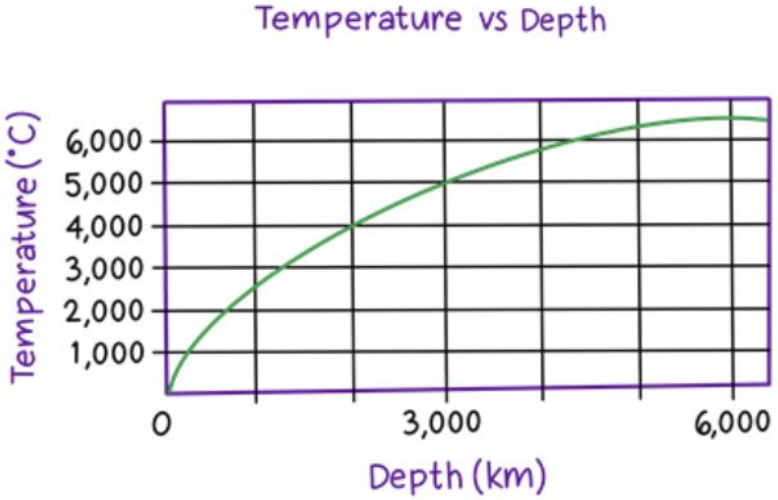
The Earth Has Layers: How do we Know?

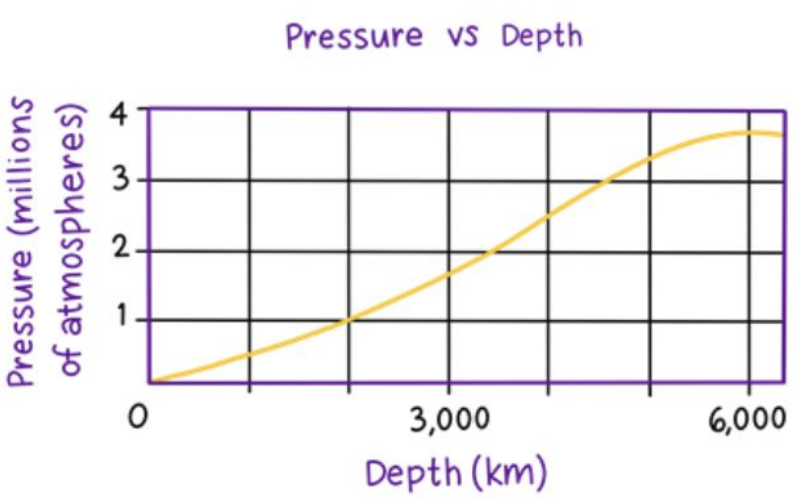


How do we measure the layers of the Earth?

- Scientists use a tool called a seismograph to measure the waves from tectonic plate movement.
  - This is indirect evidence.
- We can also use direct evidence by looking at rocks above and below the surface of Earth.

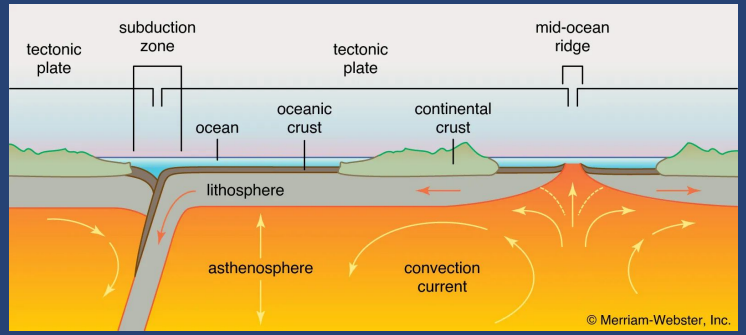
The Earth Has Layers: Why do we care?





How does the depth of the Earth impact temperature and pressure?

The Earth Has Layers: Again!

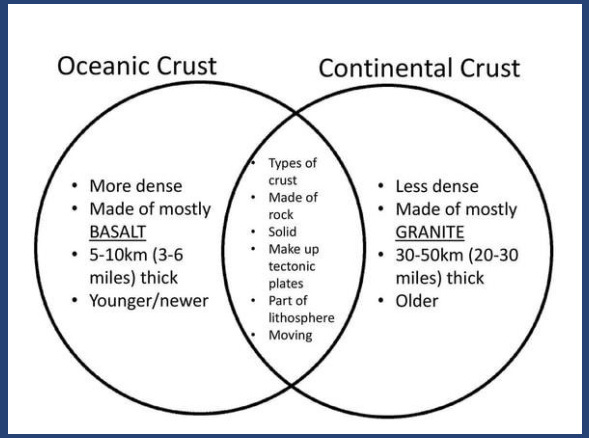


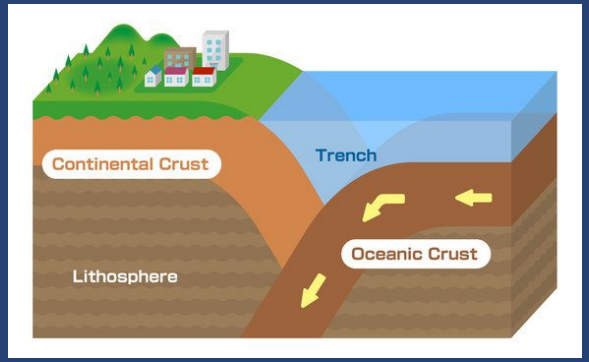


How does the Earth move?

- There are functional layers that allow the Earth to move.
- Lithosphere
  - The lithosphere is the crust and very top of the mantle. This is the part of the Earth that is split into plates and moves.
- Asthenosphere
  - This is the hot part of the mantle. Its flowing movement shifts the plates on top of the Earth.

The Earth Has Layers... and Plates!





What are Tectonic Plates?

- Tectonic Plates are the chunks of the crust/lithosphere that move around on top of the asthenosphere.
- There are 2 types of plates
  - Oceanic
    - The crust under the ocean floor.
    - Newer and more dense
  - Continental
    - The crust under the land
    - Older and less dense

Earth on the move?

What can plate movement look like on Earth?

Talk about it with your seat partner, then we'll talk as a whole group.







Earth on the move

Plate movement can look different. What we see depends on *how the plates are interacting*!

There are 3 Main categories of plate boundaries:

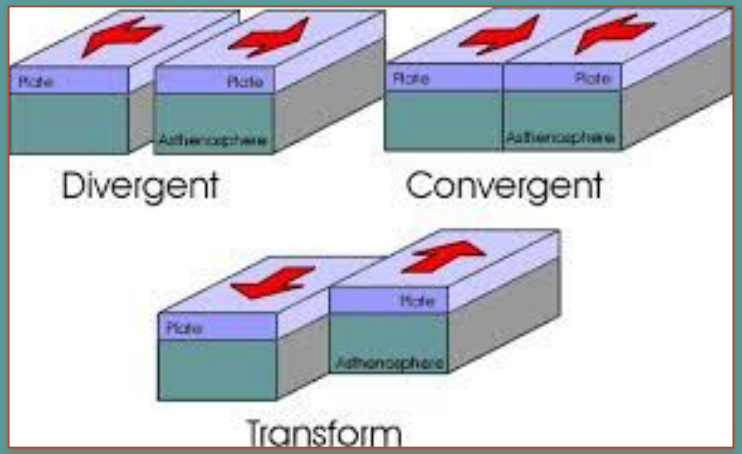
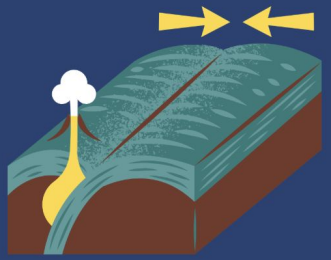
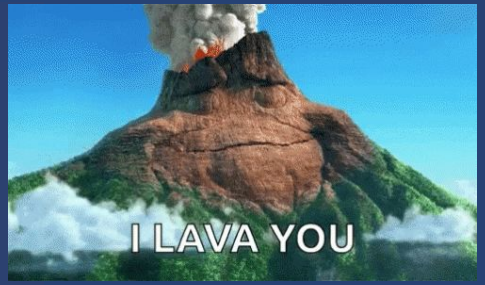
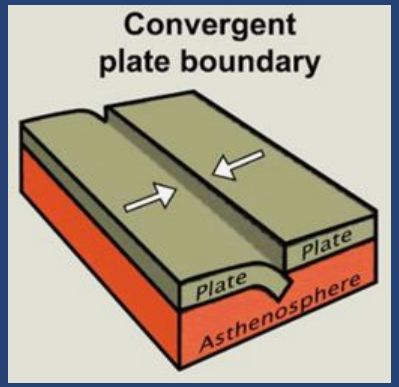


Plate Boundaries









What happens when plates converge or collide?

- Continental/Continental = folded mountains (Himalayas).
- Continental/Oceanic = volcanoes form (Cascades in Oregon and Washington)
- Oceanic/Oceanic = Volcanic arc of islands form(Aleutian Islands in Alaska)

Plate Boundaries: Type Matters

Something interesting can happen at a convergent boundary:

- If one plate is more dense than another, one plate will sink below the other.
- This is called **subduction**.

Oceanic Plates are more dense than continental plates, so this often happens when ocean meets land.

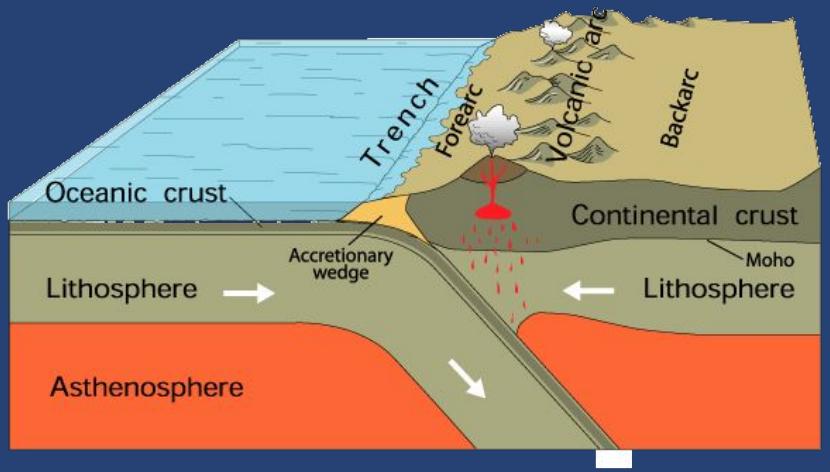
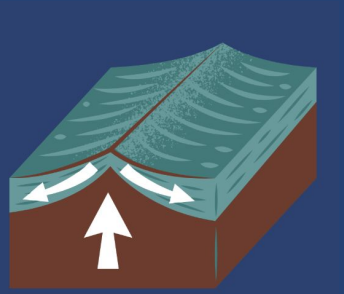
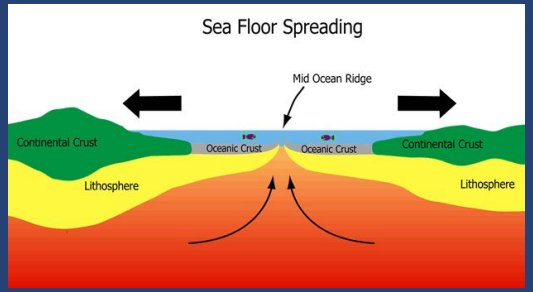
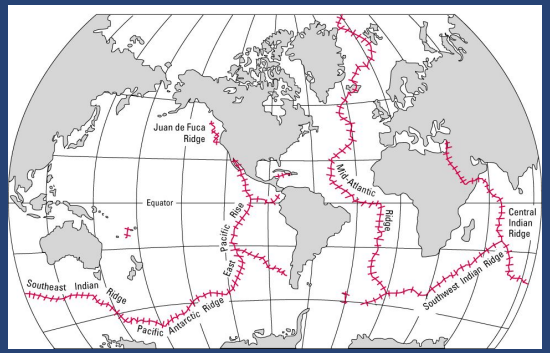


Plate Boundaries





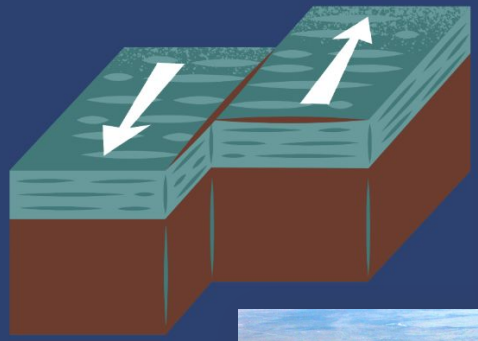


Divergent boundaries – dividing or moving apart

- Two oceanic crusts diverge and create a mid-ocean ridge (mountains under the ocean).
  - This process is call sea-floor spreading.
  - New crust is created.

- Two continental crusts diverge and create a rift valley.
  - New crust is created.
  - Example is the Great Rift Valley in Africa
  - Over millions of years water will eventually fill the valley.

Plate Boundaries







Transform boundaries

- Plates slip sideways past each other creating earthquakes.
- Crust is neither created or destroyed.
- Many of these boundaries are found on the seafloor.
- One of the most famous transform boundaries is the San Andreas fault in California.

Plate Boundaries: A song to remember

Ready for a song? The melody is to the “Addams Family.”

Converging is colliding,
Diverging is dividing,
Transform is sliding,
We are the plate boundaries.

Dah na na na. <Snap, Snap>

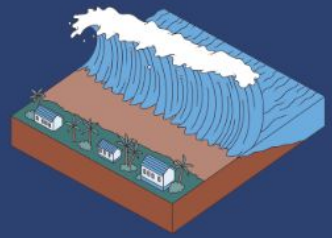






Natural Disasters that Rock the Earth





Earth on the Move and Natural Disasters

We learned that **earthquakes** are caused by plates moving past each other, and that they often happen at transform boundaries.

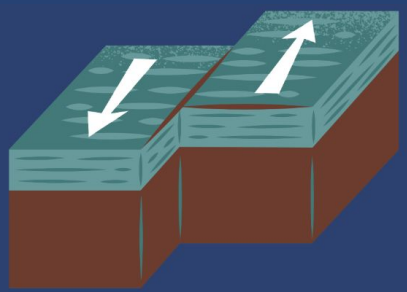
What other natural disasters are tied to the movement of the Earth?

Earth on the Move and Natural Disasters

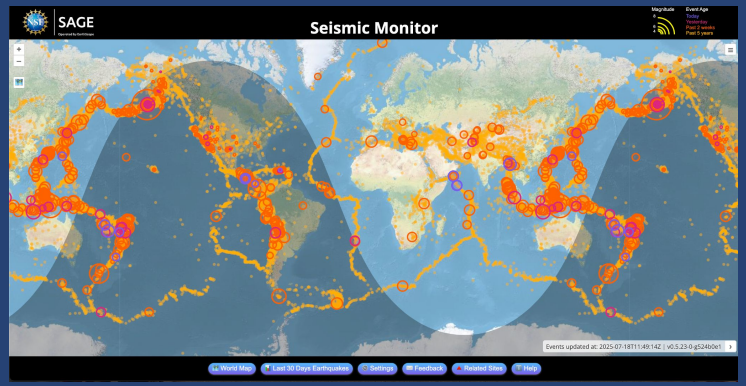
Natural Disaster that happen because the earth moves include:

- Earthquakes
- Tsunamis
- Volcanic Eruptions
- Landslides *(sometimes)*
- Sinkholes *(sometimes)*
    - Landslides and Sinkholes can be triggered because of tectonic activity **or** because of other weather events.

Earthquakes







- **Earthquakes** happen because of the *friction* between tectonic plates that move against each other.
- They can happen at any **fault line.**
  - A fault line is a break in the Earth where the crust has moved.
- **Click on the map** to explore where Earthquakes happen on Earth!

Earthquakes

How do we prepare for an Earthquake?

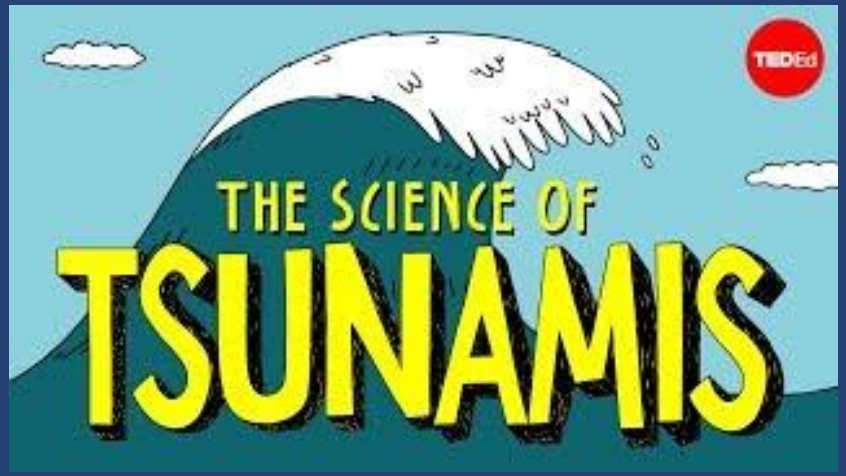
Before an earthquake:

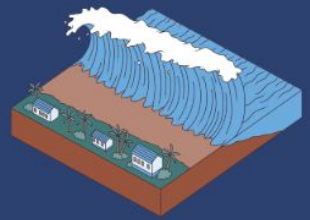
- Build structures that can withstand movement.
- Make sure structure on your walls/shelves are secure so they don't fall on you.

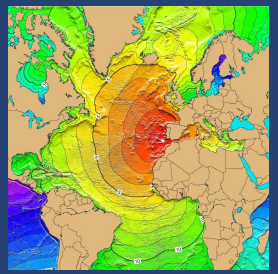
Watch the video about how to react to an earthquake!



Tsunami







- **Tsunamis** happen when water in the ocean is displaced by an **earthquake** on the ocean floor.
- They can also happen after **volcanic eruptions**.
- Tsunamis create a wave that can travel miles onto land, then recedes back to the ocean.

Tsunami

How do we prepare for a Tsunami?

Before a tsunami:

- Get to higher ground!
- Have an evacuation route planned.

Click the image to learn more about how to react to an tsunami!



Volcanic Eruptions

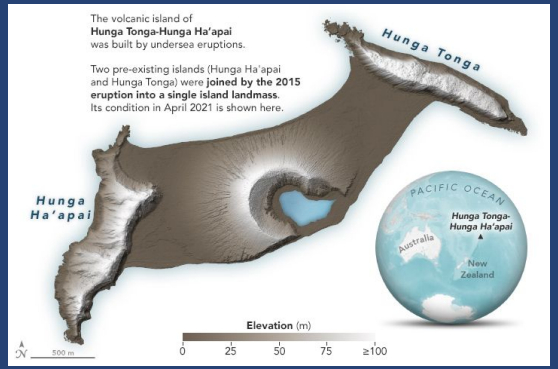




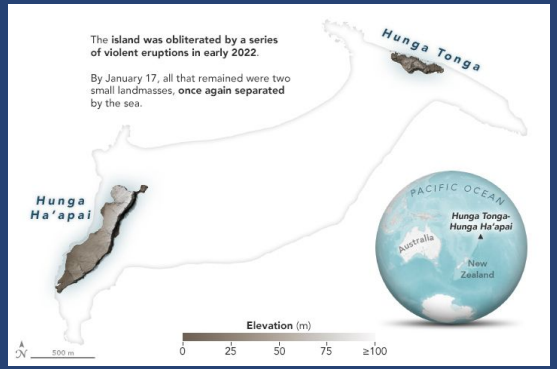


- **Volcanic Eruptions** happen when the pressure of **magma** under the Earth breaks through the crust.
- When magma comes out of the Earth, we call it **lava**.
- Many volcanic eruptions are **small enough** that they cause little risk to humans, but some eruptions are so large that they cause a lot of risk to human life.

Volcanic Eruptions



2021



2022

- The Tonga Volcanic Eruption changed the size of Hunga Tonga-Hunga Ha‘apai.
- It had been formed by volcanic activity in 2015.



Volcanic Eruptions

How do we prepare for a volcanic eruption?

Before a volcano erupts:

- Make sure you have a way to receive alerts.
- Have an evacuation plan.
- Gather emergency supplies.

Click the image to learn more about how to react to a volcanic eruption!



Landslides





- **Landslides** happen when earth is displaced, often after other **natural disasters**, like flooding, volcanos, or earthquakes.
- Landslides also include avalanches, mudslides, and falling rocks.
- Landslides happen in **all 50 states** in the US.

Landslides

How do we prepare for a landslide?

Before a landslide happens:

- Make sure you have a way to receive alerts.
- Have an evacuation plan.
- Gather emergency supplies.

Click the image to learn more about how to react to a landslide!



Sinkholes





- **Sinkholes** are areas where rock under the surface degrades over time, until eventually, it falls into itself, forming a hole in the ground.
- On average, sinkholes have caused **$300 million of damage** per year in the US.

SINKHOLES

How do we prepare for a sinkhole

Before a landslide happens:

- Evacuate immediately
- Do not get too close to the sinkhole
- Call emergency services if the hole is large and a risk to others
- Raise awareness of other members of the public and ensure that others do not enter the area of and around the sinkhole

Click the image to learn more about how to react to a sinkhole!



Now YOU Prepare!

Which Natural Disasters Should You Prepare For?

Some disasters, like flood, extreme heat and thunderstorms, can occur anywhere. Others, like earthquakes and hurricanes, are more common in certain parts of the country. Click on the map pointers to learn about disasters that are common where you live. Click the star to learn about disasters that can affect all of us.

Regardless of where you live, the Red Cross Emergency App can help you stay informed. So take a minute to download our FREE app today!

