

Topic 3: Earth as a Complex System

One way to describe Earth --- DYNAMIC---

- Earth is an evolving planet.
- There are many processes taking place.
- Therefore, Earth is always changing.
- Some changes are slow. CAN YOU THINK OF EXAMPLES?
- Some changes are rapid. CAN YOU THINK OF EXAMPLES?

Slow Changes

- ▣ Examples
- ▣ Erosion of a mountain.
- ▣ Creation of a huge mountain chain.
- ▣ Creation of an ocean or supercontinent.
- ▣ Build up of some mineral deposits.

Brand New Sea (5 Ma)



Rapid Changes

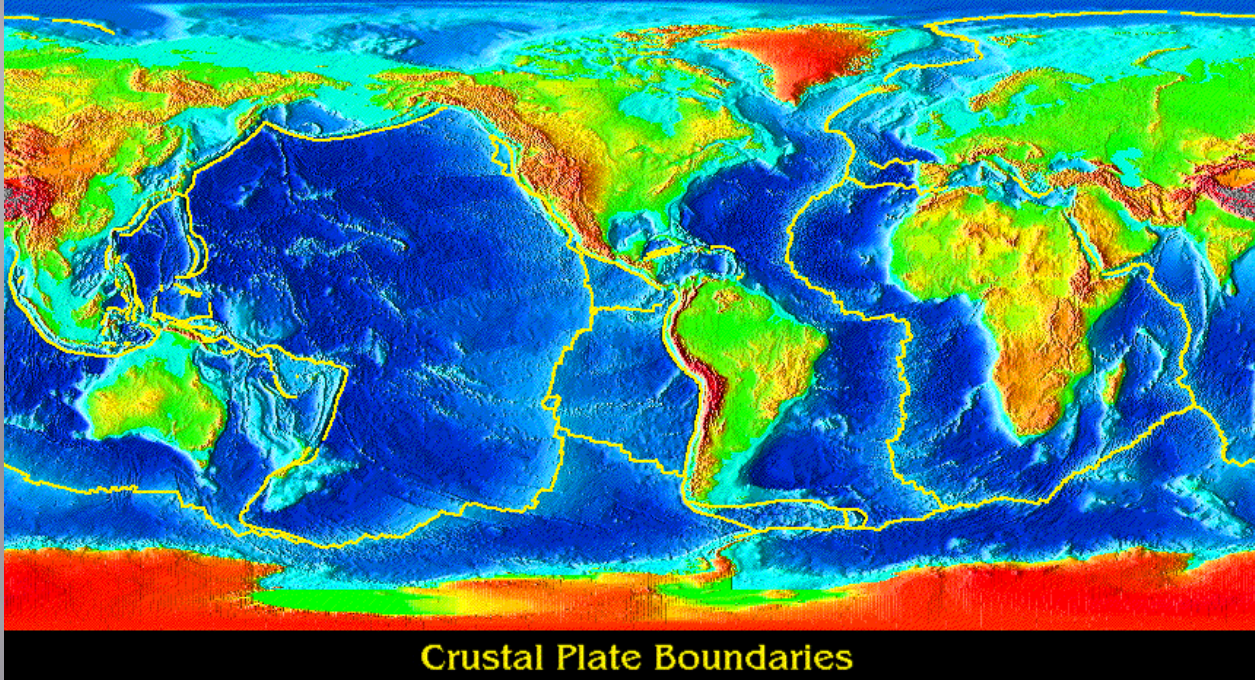
- ▣ Examples:
- ▣ Volcanoes
- ▣ Landslides
- ▣ Earthquakes



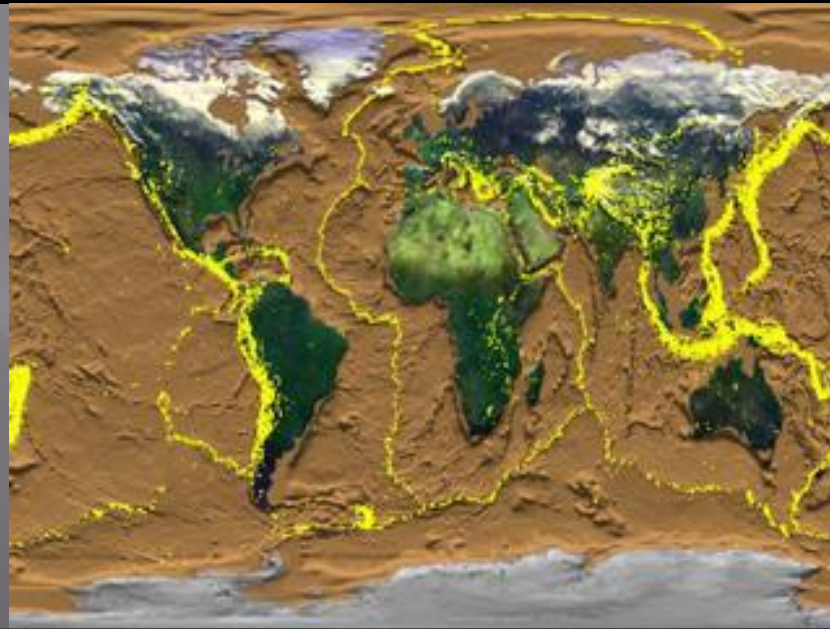
6.7
magnitude
earthquake
off the
coast of
Vancouver
Island.
Lasted for
30 seconds!

- ▣ THE ABOVE THREE MOSTLY OCCUR
SINCE EARTH IS COVERED BY CRUSTAL
PLATES.

Plates

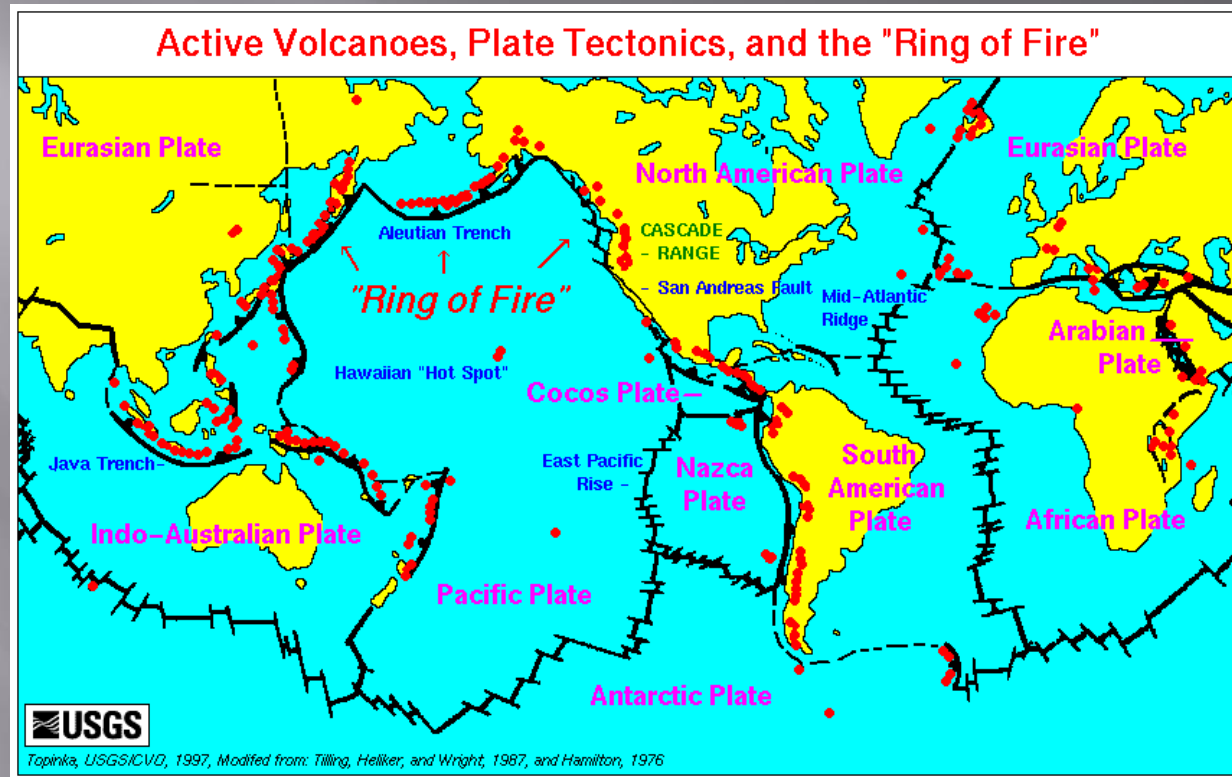


Idea of plates
was originated
by J. Tuzo
Wilson
(Canadian)!



He mapped
out the
world's
volcanoes
and
earthquakes!

Plates



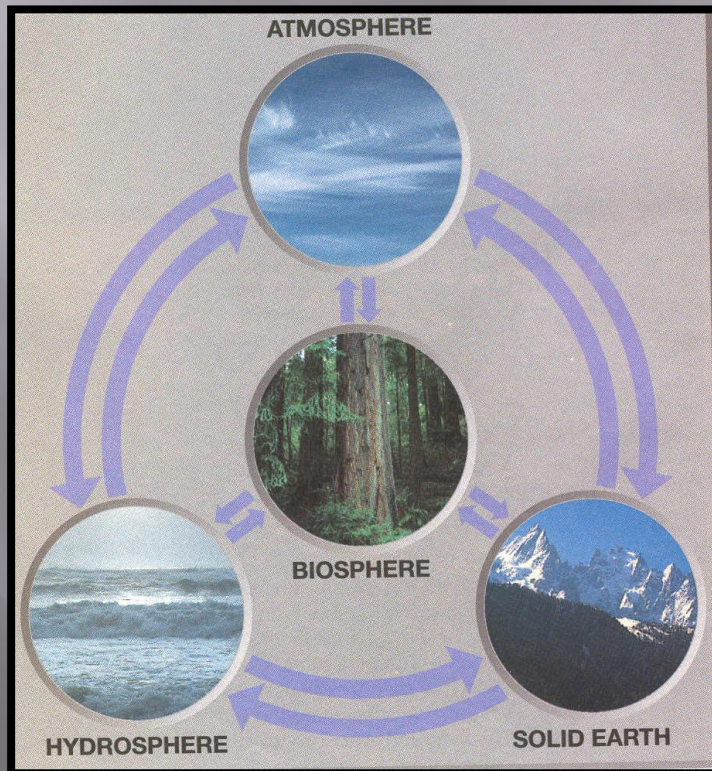
- ▣ Crustal plates exist and they move. It is at their boundaries where most ACTION takes places, especially earthquakes and volcanoes.
- ▣ Ever hear of Plate Tectonics Theory?

The Earth System

- ▣ Earth is a large-scale, complex system that is made up of a number of small-scale systems. These smaller systems are the spheres, which include: atmosphere (gaseous layer); hydrosphere (water layer); biosphere (all living things); and geosphere (solid Earth).
- ▣ Note that the geosphere is made of all Earth's layers. Geosphere does not equal lithosphere.
- ▣ Note that all of Earth's processes operate within the spheres.

System

- ▣ A system is a group of interrelated, interacting, or interdependent parts that form a complex whole.



The Earth
System and
its parts (i.e.
the spheres)!

Interaction of Spheres

- ▣ Example 1:
- ▣ Water Cycle - Water moving from the ground and organisms into the atmosphere.

- ▣ Example 2:
- ▣ Volcanic Eruption - Gases and molten material is spewed into the atmosphere and onto Earth's surface to later potentially affect life in the biosphere. "Europe's Biggest Volcano Erupts" - YouTube

- ▣ A change in one part of the system can produce changes in any or all of the other parts.

A Shoreline - Textbook - Pg. 13 - Fig. 1.10



Can you see
all four
spheres?

Spheres – Order of Formation

1st - Geosphere

2nd - Hydrosphere

3rd - Atmosphere

4th - Biosphere

Physical processes: the 4 spheres - YouTube