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Plate Tectonics Shape (and Shake) British Columbia

Geological Survey of Canada.

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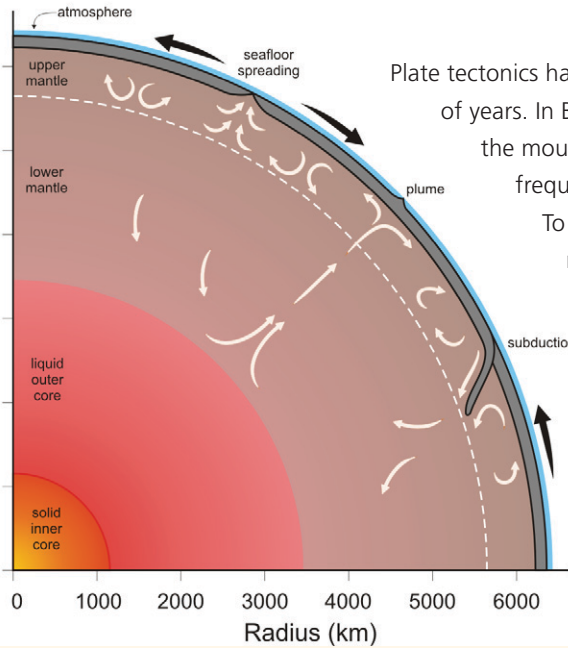


Plate tectonics have shaped the continents for millions of years. In British Columbia, they have created the mountains, and are the source of frequent earthquakes along the coast.

To understand plate tectonics, we must first understand the internal structure of the Earth. Figure 1 (left) shows a cross-section of the Earth with its layers exposed. The solid inner core is surrounded by the liquid outer core which is surrounded by the mantle. Heat from the Earth's core rises toward the surface, which causes the mantle to circulate. The outermost layer of the Earth is broken into eight major plates and dozens of smaller ones, and they move up to fifteen centimetres a year. The movement and interaction of these plates is referred to as plate tectonics.

A map of many of the world's earthquakes.

Earthquakes, Volcanoes and Plate Boundaries

Many of the world's earthquakes and volcanoes are concentrated in distinct zones along the edges of tectonic plates. Most are the result of plates colliding (at *convergent boundaries*), pulling apart (at *divergent boundaries*) or sliding past each other (at *strike-slip or transform boundaries*). Shallow earthquakes are in yellow, the deepest are in red.

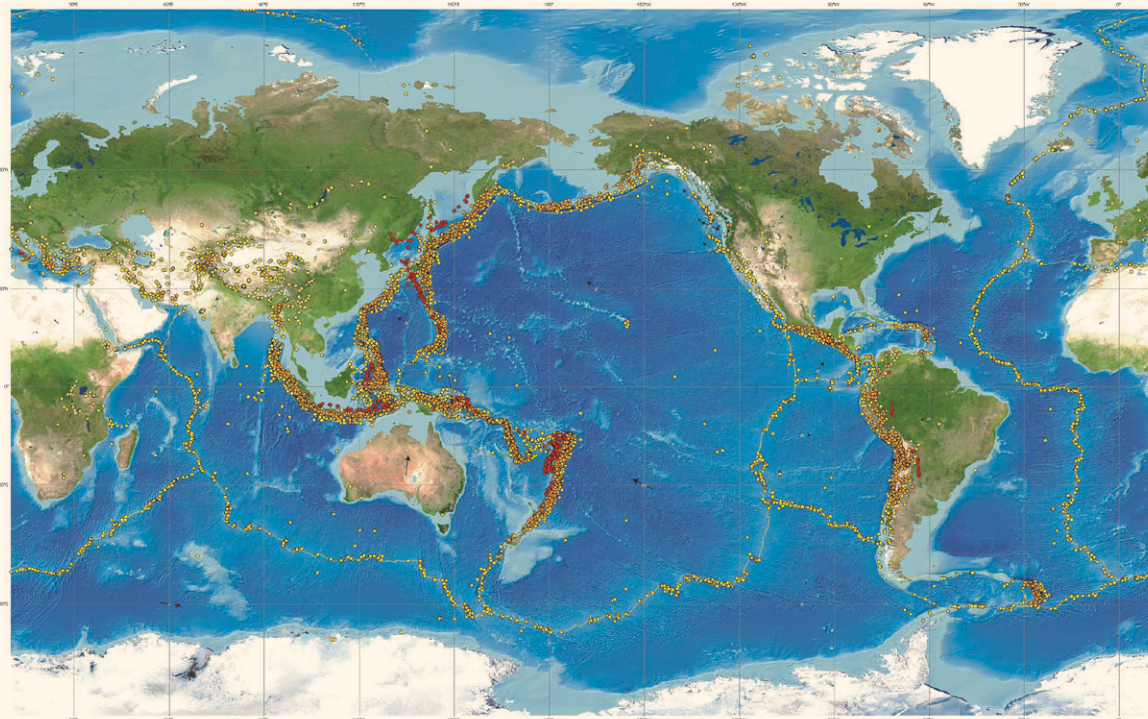


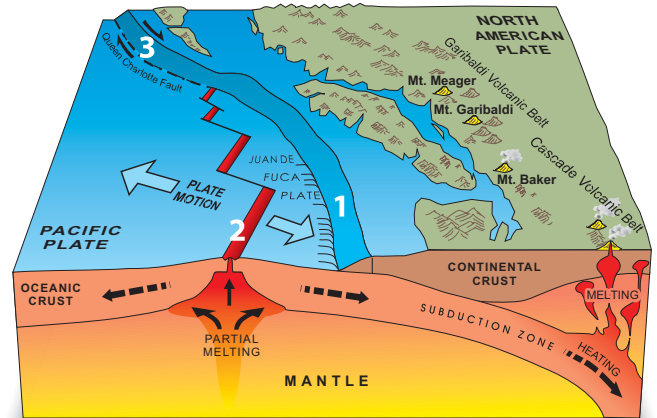
Plate Tectonics in British Columbia

Off the west coast of British Columbia there are examples of **convergent, divergent** and **strike-slip** or **transform plate boundaries**.

1. Convergent

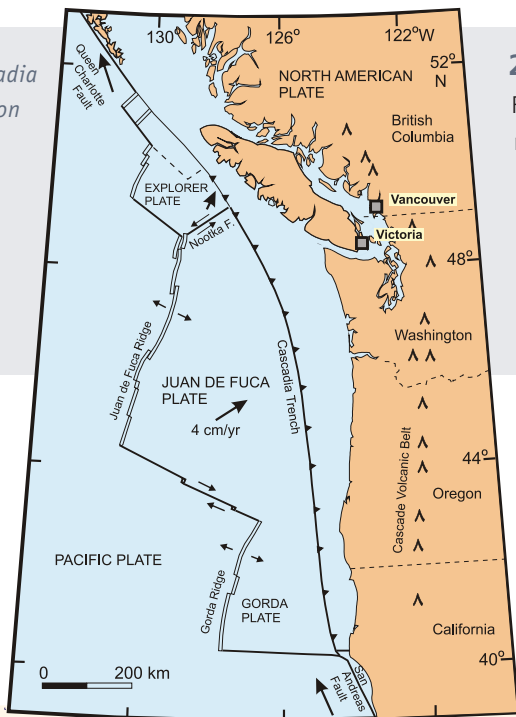
When two tectonic plates collide, one of two things happens. If they are both continental plates, the edges of the plates crumple and deform, creating mountain ranges like the Himalayas. However if one is a thin, dense oceanic plate, like the Juan de Fuca Plate, and the other is a thick, less dense plate like the North American Plate, the thin dense oceanic plate sinks, or is subducted beneath the continental plate. This is known as *subduction*. Scientists believe this gravity-controlled sinking is the driving force behind plate tectonics. The Cascadia Subduction Zone (CSZ) extends approximately 1000 km from northern Vancouver Island to northern California. The world's largest earthquakes occur in subduction zones, like the March 2011 magnitude 9.0 earthquake in Japan.

The line of volcanoes along the Pacific coast, including Mount Meager and Mount Garibaldi in Canada and the Cascade Mountains in the U.S. (e.g. Mount Baker and Mount St. Helens), are a product of the subduction zone. As the Juan de Fuca Plate *subducts* under the North American Plate, water from the Juan de Fuca Plate rises, and causes the hot rocks above to melt into magma. This magma erupts through the North American Plate surface as volcanoes. The most recent eruption in B.C. was at Mount Meager 2350 years ago.



Three types of plate boundaries:
1. Convergent
2. Divergent
3. Strike-slip or Transform.

The Cascadia Subduction Zone.



2. Divergent

Roughly 280 km offshore of Vancouver Island, the Juan de Fuca Ridge is a “spreading ridge” or long, linear submarine mountain range where new ocean floor is being produced. Hot magma from the Earth’s mantle is injected into the fractures that run the length of the ridge. New ocean floor crust is added to the Pacific Plate to the west and to the Juan de Fuca Plate to the east. Each plate is forced away from the ridge like a conveyor belt, as new ocean floor material is added. There are swarms of small earthquakes along the ridge produced by this volcanic activity.

3. Strike-slip or Transform

At the Queen Charlotte Fault, the North American Plate is moving southeast and the Pacific Plate is moving northwest relative to one another. They move past each other, with many earthquakes along the transform boundary marking their passage, including the largest earthquake ever recorded in Canada (1949, magnitude 8.1). In California, the San Andreas Fault is a similar transform plate boundary where, again, the Pacific Plate and the North American Plate are slowly sliding past each other.

Government of Canada work on plate tectonics is undertaken by Natural Resources Canada’s Earth Sciences Sector

For more information visit the Geological Survey of Canada, NRCan website:
EarthquakesCanada.nrcan.gc.ca

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