

# Plate Tectonics and Volcanism

The relationships between plate tectonics and volcanism are shown on Figure 4.3. Magma is formed at three main plate-tectonic settings: divergent boundaries (decompression melting), convergent boundaries (flux melting), and mantle plumes (decompression melting).

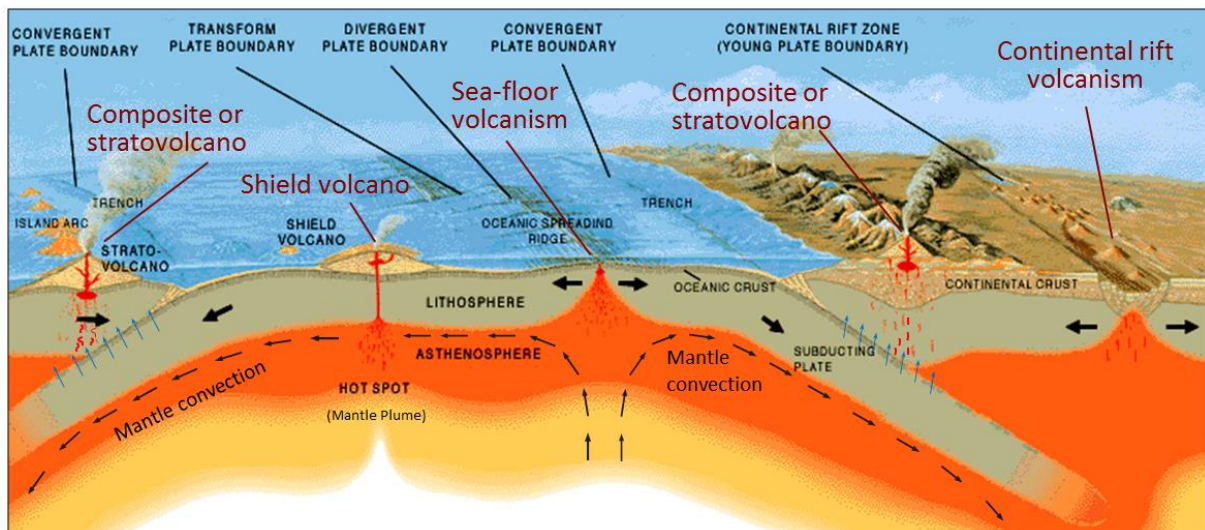


Figure 4.3 The plate-tectonic settings of common types of volcanism. Composite volcanoes form at subduction zones, either on ocean-ocean convergent boundaries (left) or ocean-continent convergent boundaries (right). Both shield volcanoes and cinder cones form in areas of continental rifting. Shield volcanoes form above mantle plumes, but can also form at other tectonic settings. Sea-floor volcanism can take place at divergent boundaries, mantle plumes and ocean-ocean-convergent boundaries. [SE, after USGS (<http://pubs.usgs.gov/gip/dynamic/Vigil.html>)]

The mantle and crustal processes that take place in areas of volcanism At a spreading ridge, hot mantle rock moves slowly upward by convection (cm/year), and within about 60 km of the surface, partial melting starts because of decompression. About 10% of the ultramafic mantle rock melts, producing mafic magma that moves upward toward the axis of spreading (where the two plates are moving away from each other). The magma fills vertical fractures produced by the spreading and spills out onto the sea floor to form basaltic **pillows** (more on that later) and lava flows. There is spreading-ridge volcanism taking place about 200 km offshore from the west coast of Vancouver Island.

At an ocean-continent or ocean-ocean convergent boundary, oceanic crust is pushed far down into the mantle. It is heated up, and while there isn't enough heat to melt the subducting crust, there is enough to force the water out of some of its minerals. This water rises into the overlying mantle where it contributes to flux melting of the mantle rock. The mafic magma produced rises through the mantle to the base of the crust. There it contributes to partial melting of crustal rock, and thus it assimilates much more felsic material. That magma, now intermediate in composition, continues to rise and assimilate crustal material; in the upper part

of the crust, it accumulates into plutons. From time to time, the magma from the plutons rises toward surface, leading to volcanic eruptions. Mt. Garibaldi is an example of subduction-related volcanism.

Text Comprehension:

1-Answer these questions:

- 1- What does the text talk about?
- 2- Where does the magma form?
- 3- How does the hot mantle move?
- 4- Why does the melting happen?
- 5- What happens when there isn't enough heat to melt the subducting crust?

2-Answer with true or false:

- 1- The plate-tectonic settings of common types of volcanism. Composite volcanoes form at subduction zones.
- 2- About 50% of the ultramafic mantle rock melts, producing mafic magma that moves upward toward the axis of spreading.
- 3- There is spreading-ridge volcanism occurring in about 400 km offshore from the west coast of Vancouver Island.
- 4- The mafic magma produced lowers through the mantle to the base of the crust.
- 5- in the upper part of the crust, it gathers into neutrons.

3- give synonyms of these words:

Zone=....., form=....., spread=..... ,

melt = ....., heat= ....., contribute= .....

4-Translate these words into arabic:

Plate Tectonics = ....., Volcanism = .....

Convergent boundaries= ....., hot mantle = .....

Felsic material=....., subduction=.....

5-Check the verbs of the text. What can you say about them? Why are they written in such a tense.

6-Re-write this paragraph into present perfect:

Usually a volcano would erupt when the pressure and magma come together. Volcanoes are also found on other planets and not only on earth. The word or name Volcano originated from the name Vulcan. Basically, a volcano erupts due to the high pressure that is built up inside the earth. An example is the Hawaii islands, which is the outcome of 5 volcanoes. There are basically two types of volcano. The safest of both forms is the Active Volcano where

eruptions are regular. There are more than 500 known active volcanoes on Earth not counting the volcanoes that happens under the sea.

\*start it like this: **Recently**, a volcano.....( finish the rest with conjugating the verbs appropriately).

7-Write a short paragraph talking about volcanoes ( you can talk about a specific volcano that happened somewhere in the world) .

## Grammar Section:

### Present Perfect:

The **present perfect** is formed from the present tense of the verb **have** and the past participle of a verb.

We use the present perfect:

- for something that **started in the past and continues in the present:**  
*They've **been** here with my family in the mountains for nearly five years.*  
*She **has lived** in Liverpool all her life.*

- when we are talking about our **experience up to the present:**

*I've **seen** a volcano before.*  
*I've **played** in the mountains with my cousins since I was young.*  
*He **has written** three books and he is working on another one.*

We often use the adverb **ever** to talk about experience up to the present:

*Yesterday's volcano was the worst thing I **have ever seen**.*

and we use **never** for the negative form:

***Have you ever witnessed a volcano?***  
*Yes, but I've **never got close to it**.*

- with **this morning/evening, today this week, this year** (when the time periods are not finished at the time of speaking):

**Have** you heard about the volcano?