

08.12.20

Plate Tectonic Theory & Volcanism

According to the theory of Plate Tectonics, along the constructive plate boundaries where the two plates are diverging [&] a central fault line is created in the zone of lithosphere, when intense thermal convection currents enter in the zone of asthenosphere, they liquify the ultra mafic peridotite magma of asthenosphere into much more liquid Gabbro form. Now this liquid gabbro magma upwell/rise along the fault line & erupt over the fault line to create several physical features like flood basalt,



→ (a thin layer of basaltic lava), lava plateau & shield volcano.

This particular phenomenon of divergence silent type of volcanic eruption & deposition of basaltic lava over the surface of earth is taking place mainly over the floor of oceanic basins. Subsequently, oceanic crust contain mafic & basaltic type of igneous rock. Although, exceptionally this particular phenomenon of divergence & eruption of basaltic lava had taken place over the surface of Indian Plate.

Subsequently, physical features like Deccan Plateau, the plateau of Kathiawar & Malwa Plateau contains the same basaltic type of mafic igneous rocks.

According to the theory of Plate Tectonics, along converging plate boundaries where the two plates are converging & oceanic plate is subducting, the explosive type of volcanic eruption would take place over the surface of earth. In this particular phenomenon of plate tectonic when melting of oceanic plate takes place in the zone of asthenosphere, the Peridotite magma of asthenosphere transform into granitic or Dioritic form. Now this more viscous, highly siliceous, felsic & semi-felsic magma upwells against gravity to produce tremendous amount of pressure over non-subducting plate. In the course of time, it breaks & blow down the thinner crust & erupts over the surface of earth with explosion. The result of explosive volcanism over non-subducting plate would create physical features like volcanic mountains or cones over the surface of earth. It should be noted that this particular type of volcanic eruption has taken

place normally over non-subducting continental plate. Subsequently, continental crust contain felsic & semi-felsic types of igneous rocks.

Distribution of Volcanoes →

Distributions of Volcanoes over the surface of earth can be explained by taking the reference of Plate Tectonic Theory. According to this theory, there are 3 certain volcanic prone zones over the surface of earth where the intensity & frequency of volcanic eruptions remain very high.

• Circum-Pacific Belt or Pacific Ring of fire

is a zone where several plates are converging & explosive type of volcanic eruption is much more prominent. This belt begins from Erebus Mountain of Antarctica outline the western coast of South & Central America & create the boundary of Rockies Mountain & near Alaska enters in over the eastern coast of Asia & South-East Asia. It also create the boundary of Japan, Philippines

Island, East Asia, South-East Asia & finally terminates near Indonesia.

This zone is prominently a converging belt zone where several oceanic plates like Juan de Fuca, Cocos, Nazca, Pacific Philippines, Mariana etc are converging with continental or other oceanic plates. The resultant product of this convergence is explosive volcanism & formation of several volcanic mountains over non-subducting plates. There are approx. 50 active volcanoes & 30 calderas located in the same zone of circum-Pacific & islands like Japan & Philippines are also the ramification of explosive volcanic eruption over non-subducting plate.

Japan Island Arc is a prominent volcanic physical structure created by the convergence of several plates.

These plates meet at a triple junction of Island of Honshu.

It should be noted that formation of Northern Arc is due to the

subduction of Pacific Plate within the Plate of Eurasia. The central arc is created by subduction of Pacific plate within the Philippine Plate.

& the Southern arc is formed due to the subduction of Philippine plate within the Eurasian Plate.

• Mid-Continental Belt :-

It is also a very prominent volcanic prone zone located between the converging plates of Africa, Arabia, India Australia, & Eurasian Plate. This belt starts from Western Europe outline the whole basin of Mediterranean Sea create the boundary in regions like Turkey, Iran, Himalayas & merges with Circum-Pacific belt near Indonesia.

The process of volcanism in the region of Mediterranean is a result of continental - continental convergence & oceanic plate between them. After the convergence of African Plate to the plate of Eurasia the intervening Tethys Plate

gets segregated into several minor plates like Transylvanian plate, Calabrian Plate ~~Aegean~~ Plate, Tyrrhenian plate etc.

It should be noted that most of the volcanees of Mediterranean origin like (Stromboli) Mount Stromboli, Mount Etna, Mount Vulcano, Mount ~~Vesuvius~~^{Vesuvius}, Mount Puxxoli, Mount Santorini etc are the result of continental-oceanic & oceanic-oceanic plate convergence.

At present Transylvanian micro plate is subducting under Eurasian Plate. African plate subducts under ~~Aegean~~^{Aegean} plate, African Plate under Anatolian Plate, etc.

Volcanic ~~eruption~~ Eruption in Himalayan Physiographical Region had taken place by the subduction of Tethys Oceanic plate within the plate of Eurasia when the plate of India converges with the plate of Eurasia. It should be noted that no such type of explosive volcanic eruption ~~is~~ is taking place in Himalayan Physiographical Region in present

geological time scale due to 2 possible factors →

- ▷ Complete melting of Tethys Oceanic plate had taken place.
- ii) Upwelling magma does not able to break & blow the thicker crust of Eurasian plate.

The convergence of Indo-Australian plate with the plate of Eurasia is also a feature of continental-continental plate convergence. The convergence & subduction of Indo-Australian ^{plate} within the plate of Eurasian Sunda has started the process of explosive volcanism over non-subducting Sunda Plate. In the course of time, by the regular deposition & solidification of lava over the surface of non-subducting Sunda Plate the formation of several volcanic physical features have taken place over the surface of same Sunda plate. At present, the extent of these volcanic physical ~~feature~~ features above the sea level get the designation of Indonesian Archipelago.

Mid-Atlantic Belt :-

It is located in the central basin of Atlantic Ocean where silent type of volcanic eruption is much more prominent along the central fault line & divergence of respective plates.
