VOLCANOS AROUND THE PACIFIC OCEAN

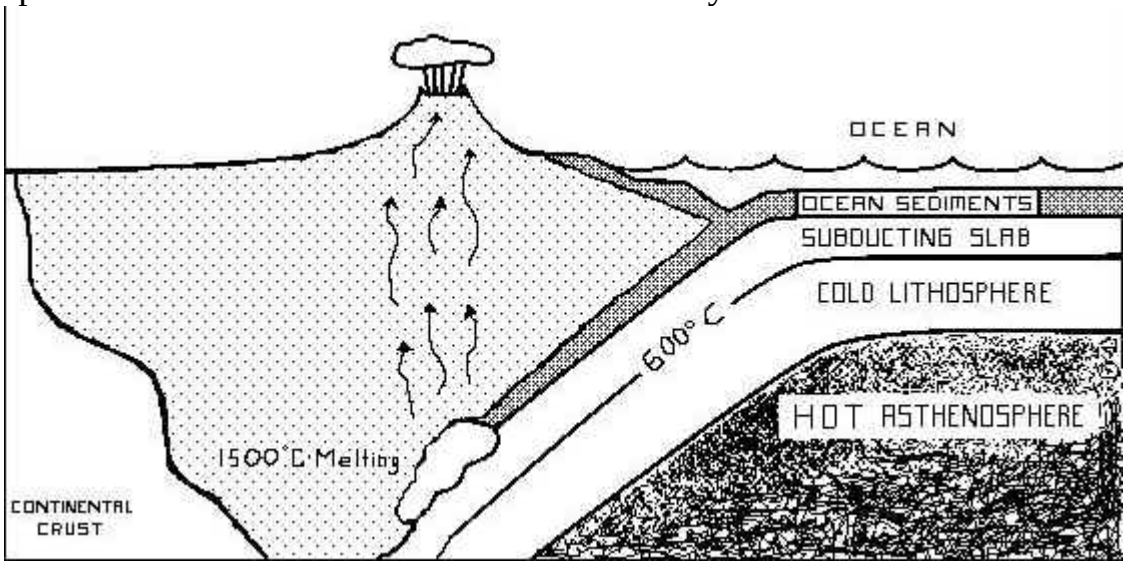
Around the rim of the Pacific Ocean there is a ring of volcanism and earthquake activity that generates considerable concern for the safety of people and property in that region. Vulcanologists monitor the dormant and active volcanos in an effort to provide an early warning system for communities that might need to evacuate in the event of an eruption. Modern technology enables these geologists to monitor numerous factors that have been identified as indicators of increased activity and probable precursors to eruptions. These factors may also provide clues to the processes occurring subsurface that contribute to the eruption events.

It is hoped that an increased understanding of the subsurface processes will increase the predictive power of the vulcanologists but understanding processes does not answer the very human question, "Why does this happen?" Other information sources are needed to help us grapple with that issue. The answer to that question remains speculative but some basic information about the processes that produce some of the molten rock within the earth may be helpful. Since there is a volcanic rim around the Pacific Ocean, this paper will begin by looking at that region.

The Ring of Fire

Along the margins of the Pacific Ocean, there are deep trenches. The Pacific Ocean floor sinks into these trenches and slides below the rocks that form the continental crust. (See diagram.) This process is referred to as subduction and volcanologists suggest that this subduction process produces the source material for most of the volcanism surrounding the Pacific Ocean, hence the phrase "Ring of Fire." The subducting oceanic slab carries seawater and some crustal material with it. The more deeply these materials are subducted the higher the temperatures and pressures are around the rocks. Eventually the combination of volatiles or gases produced from the seawater and crustal material with increasing pressures and temperatures cause melting of the subducted slab and upper mantle. The melted rock or magma then begins to rise through the continental crust, generating new, and utilizing old, fractures and faults and incorporating additional crustal material as it moves. (Refer to diagram.) When the crustal rocks melt, some rock types chemically decompose and release gases, e.g. carbon dioxide and sulfur dioxide. The rising magma may mix with magmas from other sources, which also contribute volatiles. Gases increase the pressure within the

magma and decrease its density, which aids in the upward movement of the molten rocks along faults; however, molten rock moving along fractures does not mean that a volcano is about to erupt. Vulcanologists look for specific indicators of imminent volcanic activity.



Eruption Precursors

Data is collected on volcanos worldwide because scientists want to know when the next eruption will occur. Information that seems most useful includes seismic (earthquake) activity and types of gases that are being emitted. Common gases released from volcanic fissures and craters include sulfur dioxide, carbon monoxide, carbon dioxide, hydrogen sulfide and water vapor. Earthquake activity increases dramatically just prior to an eruption. Most of the activity is about 4 or less on the Richter Scale; however, larger-scale earthquakes can occur with loud noises, liquefaction, and other earthquake related activity. As pressures build within the magma chamber due to the incorporation of volatiles from the surrounding crustal rocks, the potential for eruption increases.

The Eruption

Eruption occurs when the pressure in the magma chamber exceeds the pressure exerted by the weight of the overlying rocks. Loud explosions and earthquakes often precede and accompany the ejection of lava, incandescent rocks, gases and ash. Once the eruption occurs, many people are interested not only in what happened but also ask, "Why did this happen?"

Conclusions

Very little is really known about the subsurface processes that contribute to volcanism. Most of the theories are developed from surface measurements. As vulcanologists attempt to study these processes, they hope to explain why eruptions occur.