

Volcanic Activity - Ch. 6

Websites:

U.S. Geological Survey Volcano Hazards Program
<http://volcanoes.usgs.gov/>

Smithsonian/U.S.G.S. Weekly Volcanic Activity Report
<http://www.volcano.si.edu/reports/usgs/index.cfm>

Volcano World
<http://volcano.und.nodak.edu/>

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Volcanic Activity - Ch. 6

- I. Locations of Volcanoes
- II. Type of Volcanoes
- III. Volcanic Hazards
- IV. Case Study: Mt. St. Helens
- V. Forecasting Volcanic Activity

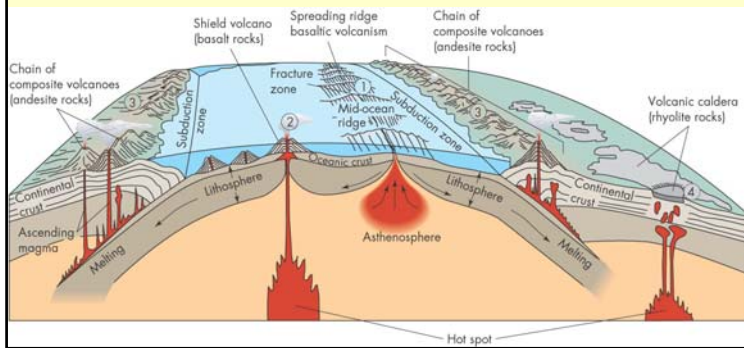
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I. Locations of Volcanoes

Tectonic Settings of Volcanic Activity

Figure 6.11 p. 177

1. Divergent plate boundaries (rift zones)
2. Ocean-ocean convergent plate boundaries (volcanic island arcs)
3. Continent-ocean convergent plate boundaries (volcanic mountain range)
4. Hot spots



Tectonic Settings of Volcanic Activity

Figure 6.4 p. 172



Tectonic Settings of Volcanic Activity

Figure 6.3 p. 171

U.S. Volcanic Regions



Tectonic Settings of Volcanic Activity

Figure 6.3 p. 171

U.S. Volcanic Regions: Aleutian Islands/South Alaska tectonic origin?



Tectonic Settings of Volcanic Activity

Figure 6.3 p. 171

U.S. Volcanic Regions: Hawaiian Islands tectonic origin?



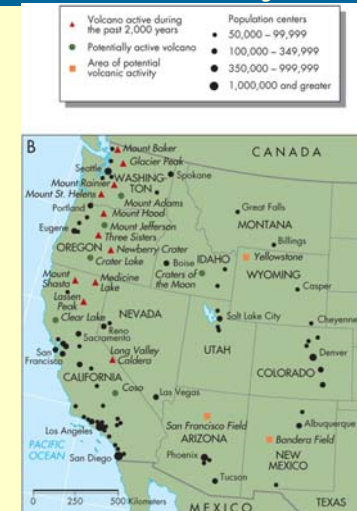
Tectonic Settings of Volcanic Activity

Figure 6.3 p. 171

U.S. Volcanic Regions:

Cascade Mountains tectonic origin?

Yellowstone National Park
Craters of the Moon
Snake River Plain tectonic origin?

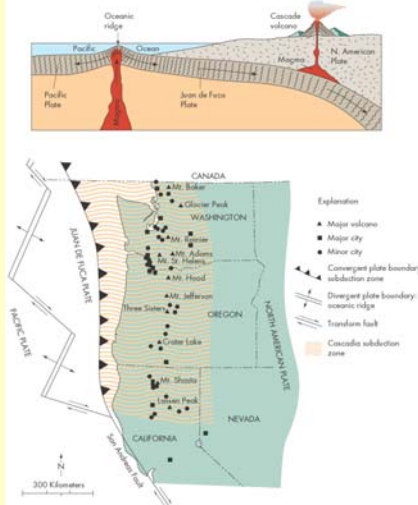


Tectonic Settings of Volcanic Activity

Figure 6.13 p. 178

U.S. Volcanic Regions:

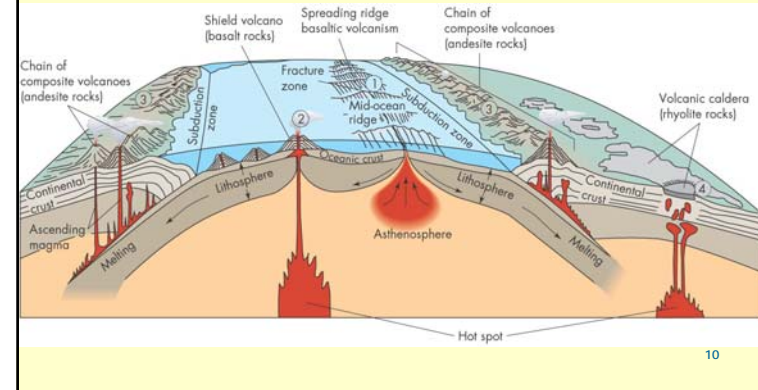
Cascade Mountains
tectonic origin?



II. Types of Volcanoes

Figure 6.11 p. 177

Tectonics → magma type → volcanic features



II. Types of Volcanoes

Table 6.2 p. 173

Tectonics → magma type → volcanic features

TABLE 6.2 Types of Volcanoes

Volcano Type	Shape	Silica Content of Magma	Viscosity	Rock Type Formed	Eruption Type	Example
Shield volcano	Gentle arch, or shield shape, with shallow slopes; built up of many lava flows	Low	Low	Basalt	Lava flows, tephra ejections	Mauna Loa, Hawaii Figure 6.5
Composite volcano, or stratovolcano	Cone-shaped; steep sides; built up of alternating layers of lava flows and pyroclastic deposits	Intermediate	Intermediate	Andesite	Combination of lava flows and explosive activity	Mt. Fuji, Japan Figure 6.7
Volcanic dome	Dome shaped	High	High	Rhyolite	Highly explosive	Mt. Lassen, USA Figure 6.8
Cinder cone	Cone shaped; steep sides; often with summit crater	Low	Low	Basalt	Tephra (mostly ash) ejection	Springville, AZ Figure 6.9

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II. Types of Volcanoes

Tectonics → magma type → volcanic features

Magma type → eruption type

- Magma Type: **viscosity, water content**
- silica content: **more silica = higher viscosity = more explosive**
- water content: **more water (as a gas) = more explosive**
- temperature: **hotter = lower viscosity**
- rocks produced: **low silica = basalt**
- middle silica = andesite**
- high silica = rhyolite**

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II. Types of Volcanoes

Tectonics → magma type → volcanic features
 Magma type → eruption type

Range of Eruptive Styles

<p><u>effusive</u></p> <ul style="list-style-type: none"> quiet, fluid high temperature low silica low water content low viscosity basaltic lava lava flows 		<p><u>explosive</u></p> <ul style="list-style-type: none"> violent low temperature high silica high water content high viscosity rhyolitic lava/magma pyroclastics
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II. Types of Volcanoes

Tectonics → magma type → volcanic features
 Magma type → eruption type

Range of Eruptive Styles

<p><u>effusive</u></p> <ul style="list-style-type: none"> hot spots under ocean crust rift zones on ocean floor 		<p><u>explosive</u></p> <ul style="list-style-type: none"> hot spots under continental crust subduction zones rift zones on continents
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II. Types of Volcanoes

Tectonics → magma type → volcanic features
 Eruption style → volcanic feature

Range of Eruptive Styles

<p><u>effusive</u></p> <ul style="list-style-type: none"> lava flows shield volcanoes cinder cones basalt 		<p><u>explosive</u></p> <ul style="list-style-type: none"> pyroclastics calderas volcanic domes rhyolite
<p><u>mixed eruptions</u></p> <ul style="list-style-type: none"> pyroclastics and lava andesite composite volcanoes 		

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II. Types of Volcanoes

Effusive eruptions: lava flows, shield volcanoes, cinder cones, basalt Figure 6.6 p. 174

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II. Types of Volcanoes

Effusive eruptions: lava flows, shield volcanoes, cinder cones, basalt

A topographic map of the Hawaiian Islands. The map shows the main islands with contour lines indicating elevation. Key locations labeled include Kohala, Hamakua Coast, Mauna Kea, Hilo, Kilauea, Puna Coast, Kailua, Kona Coast, and Mauna Loa. A scale bar at the bottom indicates 0, 10, and 20 miles, with a contour interval of 1000 feet. The word 'Hawaii' is written at the bottom center of the map.

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II. Types of Volcanoes

Effusive eruptions: lava flows, shield volcanoes, cinder cones, basalt

A wide-angle landscape photograph showing a dark, rocky foreground leading to a vast, flat plain. In the distance, two large, rounded mountain peaks are visible under a clear blue sky. The left peak is labeled 'Mauna Kea' and the right peak is labeled 'Mauna Loa'.

Mauna Kea Mauna Loa

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II. Types of Volcanoes

Effusive eruptions: lava flows, shield volcanoes, cinder cones, basalt

An aerial photograph of the Kilauea Summit. The image shows the volcanic landscape with various features labeled: Puu Oo Vent, Volcano Village, Kilauea Iki, Kilauea Summit Caldera, Halemaumau Crater, Crater Rim Cabin, Volcano Golf Course, and Hawaiian Volcano Observatory. The Pacific Ocean is visible in the upper right corner.

II. Types of Volcanoes

Effusive eruptions: lava flows, shield volcanoes, cinder cones, basalt

see Figure 6.9 p. 176

Cinder Cones

A photograph of a cinder cone volcano, showing its conical shape and dark, rocky surface. To the right is a cross-section diagram of a cinder cone. The diagram shows a central vent leading to a crater at the top. The interior of the cone is labeled 'Cinder cone filled with loose fragments'. The diagram also shows 'Pyroclastic material' being ejected from the vent.

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II. Types of Volcanoes

Effusive eruptions: lava flows, shield volcanoes, cinder cones, basalt

Paricutin, Mexico, 1943

see Figure 6.10 p. 176

II. Types of Volcanoes

Mixed eruptions: lava flows and pyroclastic debris, composite volcanoes, andesite

Figure 6.7 p. 174

Mt. Fuji, Japan

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II. Types of Volcanoes

Mixed eruptions: lava flows and pyroclastic debris, composite volcanoes, andesite

Mt. St. Helens, pre-1980

Figure 6.27 p. 191

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II. Types of Volcanoes

Mixed eruptions: lava flows and pyroclastic debris, composite volcanoes, andesite

Shield Volcano vs. Composite Volcano

Profile of Hawaiian shield volcanoes (Mauna Loa and Kilauea) compared with the profile of Mount Rainier, one of the larger Cascade Range composite volcanoes, drawn at the same scale.

USGS
Topinka, USGS/CVO, 1998, Modified from: Tilling, Heliker, and Wright, 1987, Eruptions of Hawaiian Volcanoes: Past, Present, and Future

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II. Types of Volcanoes

Explosive eruptions: pyroclastic debris, calderas, lava domes, rhyolite



Figure 6.8 p. 175

Mt. Lassen, 1914

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Caldera Formation: Crater Lake, OR

II. Types of Volcanoes

Explosive eruptions: caldera

Crater Lake, Oregon



II. Types of Volcanoes

Explosive eruptions: caldera

Figure 6.8 p. 175

Long Valley Caldera, California



Figure 6.17 p. 182

ash from eruption 700,000 years ago

