VOLCANOES
Tectonics of Magma

• Basaltic magma
  – From partial melting of mantle
  – Occurs at oceanic ridges and mantle plumes
  – More dense: makes oceanic crust

• Granitic magma
  – From melting of crust, with water as flux
  – Occurs at convergent boundaries
  – Less dense: makes continental crust
Terms

- **Viscosity**: resistance to flow
- **Pyroclastic**: material blown into the air by volcanic eruption

What is the relationship of lava viscosity to pyroclastic production by a volcano?

Greater viscosity = more likely to have pyroclastic material
Table 8.1 Magmas have different compositions, which cause their properties to vary

<table>
<thead>
<tr>
<th>Composition</th>
<th>Silica Content</th>
<th>Viscosity</th>
<th>Gas Content</th>
<th>Tendency to Form Pyroclastics</th>
<th>Volcanic Landform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basaltic (Mafic)</td>
<td>Least (~50%)</td>
<td>Least</td>
<td>Least (1–2%)</td>
<td>Least</td>
<td>Shield Volcanoes</td>
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<td>Basalt Plateaus</td>
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<td></td>
<td>Cinder Cones</td>
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<tr>
<td>Andesitic (Intermediate)</td>
<td>Intermediate (~60%)</td>
<td>Intermediate</td>
<td>Intermediate (3–4%)</td>
<td>Intermediate</td>
<td>Composite Cones</td>
</tr>
<tr>
<td>Rhyolitic (Felsic)</td>
<td>Most (~70%)</td>
<td>Greatest</td>
<td>Most (4–6%)</td>
<td>Greatest</td>
<td>Pyroclastic Flows</td>
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<tr>
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<td>Volcanic Domes</td>
</tr>
</tbody>
</table>

- Volcanic gas information below

http://www.wooster.edu/geology/bjordan/ECalPics/ECal.html (dead link 2007.11.13)
Volcanic bombs

http://volcanoes.usgs.gov/Products/Pglossary/bomb.html
Sept. 2002

Volcanocam see http://www.fs.fed.us/gpnf/volcanocams/msh/

Photo credit see http://www.roddyscheer.com/mt_st_helens.html
Pahoehoe lava

http://www.doubledeckerpress.com/pahoe.htm
http://www.mistermoose.org/rtw/usa/hawaii/pahoehoe.html
http://www.wooster.edu/geology/bjordan/ECalPics/ECal.html
http://volcanoes.usgs.gov/Products/Pglossary/bomb.html
http://www.bol.ucla.edu/~asuarezn/Paricutin_page.html
Lava fountaining

Basaltic lava flows

Fissure
Active Lava Tube

http://www.doubledeckerpress.com/skylight.htm
Parícutin

http://www.greenville.k12.oh.us/volcano/cindercone.html
Cinder cones

http://courses.unt.edu/hwilliams/GEOG_3350/examreviews/volcanic_structures.htm
Pyroclastic material

Crater

Central vent filled with rock fragments
http://www.greenville.k12.oh.us/volcano/cindercone.html
San Juan Parangaricutiro

http://www.bol.ucla.edu/~asquarezn/Paricutin_page.html
A. Mauna Loa, Hawaii, a large shield volcano

B. Mt. Rainier, Washington, a large composite cone

C. Sunset Crater, Arizona, a large cinder cone
## Eruptions of the Past 4000 Years

<table>
<thead>
<tr>
<th>Volcano</th>
<th>Years Before Present</th>
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</thead>
<tbody>
<tr>
<td>Mount Baker</td>
<td></td>
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<tr>
<td>Glacier Peak</td>
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<tr>
<td>Mount Rainier</td>
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<tr>
<td>Mount St. Helens</td>
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<tr>
<td>Mount Adams</td>
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<tr>
<td>Mount Hood</td>
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<td>Mount Jefferson</td>
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<td>Three Sisters</td>
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<td>Newberry Volcano</td>
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<td>Crater Lake</td>
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<td>Medicine Lake Volcano</td>
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<td>Mount Shasta</td>
<td></td>
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<tr>
<td>Lassen Peak</td>
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</tbody>
</table>

[http://ve.ou.edu/weaver/st_helens/sthelens.htm](http://ve.ou.edu/weaver/st_helens/sthelens.htm)
Blasted summit of Mt. St. Helens

http://ve.ou.edu/weaver/st_helens/sthelens.htm
Whaleback dome in Mt. St. Helens

http://ve.ou.edu/weaver/st_helens/sthelens.htm
http://www.geology.sdsu.edu/how_volcanoes_work/Pelee.html
Video of nuee ardente: http://www.bedford.k12.ny.us/flhs/science/apes/images.html
http://www.geo.mtu.edu/volcanoes/west.indies/soufriere/govt/images/051296/pf_sea.mpg
St Helens Blast Zone

http://ve.ou.edu/weaver/st_helens/sthelens.htm
Link to Nevado del Ruiz
http://volcanoes.usgs.gov/Hazards/What/Lahars/RuizLahars.html
http://ve.ou.edu/weaver/st_helens/sthelens.htm
Crater Lake
Eruption of Mount Mazama

Partially emptied magma chamber
Collapse of Mount Mazama

Formation of Crater Lake and Wizard Island
STAGE 1
INFLATION BEGINS

TILTMETER

GPS STATIONS

Magma reservoir begins to swell.

STAGE 2
INFLATION AT PEAK

Magma reservoir inflates.

Stressed rocks - zone of earthquakes

Distances and elevations increase

STAGE 3
ERUPTION - DEFLATION

Volcano shape returns to normal

Distances and elevations decrease

Flood basalt

http://www.gly.uga.edu/railsback/FieldImages/BasaltTwinFalls.jpeg
Deccan basalt

http://www.accuracyingenesis.com/deccan.html
Volcanic summary

A. Implacement of magma