Volcanism & Extrusive Rocks

VOLCANISM

• Lava = Magma at earth surface
• Intrusive vs. Extrusive Rocks
• Violent vs. “Quiet” eruptions

Effects on Humans

• Growth of Hawaii
• Geothermal energy
• Effect on climate
• Volcanic catastrophes

Eruptive Violence & Characteristics of Lava

• Gas in lava
• Viscosity
  – Temperature
  – Silica content
    • Silica ranges from 45% to 75%
    • Silicic lavas- most viscous
    • Mafic lavas- least viscous
    • Silicic---Intermediate---Mafic

Extrusive Rocks & Gases

• Gases
  – Primarily H₂O
  – Also CO₂, SO₂, H₂S, HCl
• Gases & pyroclasts
  – Airfall pyroclasts (ashfall)
  – Pyroclastic flow

VOLCANOES

• Volcanoes are cone-shaped
• Vent
• Crater
• Flank eruption
• Caldera
• Types:
  – Shield, Cinder Cone, Composite

SHIELD VOLCANOES

• Low viscosity lava flows
  – Low silica magma- mafic
  – Basalt
    • Pahoehoe
    • Aa
• Gently sloping flanks- between 2 and 10 degrees
• Tend to be very large

**CINDER CONES**

• Formed of pyroclasts only
  – Pyroclasts:
    • Dust, Ash, Cinder, Block, Bomb
• Steep sides—~30 degrees
• Relatively small
• Short duration of activity

**COMPOSITE VOLCANO**

• Alternating pyroclastic layers & lava flows
• Slopes intermediate in steepness
• Intermittent eruptions over long time span
• Mostly *Andesite (Intermediate)*
• *Distribution*
  – Circum-Pacific Belt (“Ring of Fire”)
  – Mediterranean Belt

**VOLCANIC DOMES**

• Forms above a volcanic vent
• Viscous lava
  – Usually silica-rich (or cooler magma)
• Associated with violent eruptions
  – Notably, pyroclastic flows

**LAVA FLOODS**

• Mafic lava—solidifies to basalt
• Fissure flows
  – Plateau basalts

**LAVA FLOODS**

• Mafic lava—solidifies to basalt
• Fissure flows
  – Plateau basalts
• Columnar structure or jointing
• Lava tubes

**SUBMARINE ERUPTIONS**

• Pillow basalt

**Extrusive Rocks**

• Importance of silica content
- Rhyolite- silicic
  - Predominantly feldspar and quartz
- Andesite- intermediate
  - Plagioclase feldspar & ferromagnesian minerals
- Basalt- mafic
  - Ferromagnesian minerals & plagioclase feldspar
- Textures
  - Fine-grained (smaller than 1 mm)
  - Glassy- Obsidian
    - Due to
      - rapid cooling (mainly)
      - high viscosity
  - Due to trapped gas
    - Vesicles
      - Vesicular basalt
    - Pumice
  - Fragmental
    - Made of pyroclasts
      - Dust, ash, cinders-tuff
      - Blocks & bombs- volcanic breccia