GSA 0335

Vulcanismo e Mineralizações Associadas

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14/09/2020

PLANO DA AULA

- Tipos de vulcões
- Modo de ocorrência dos rochas vulcânicas e subvulcânicas

Tipos de Vulcões

(baseado no tipo da erupção)

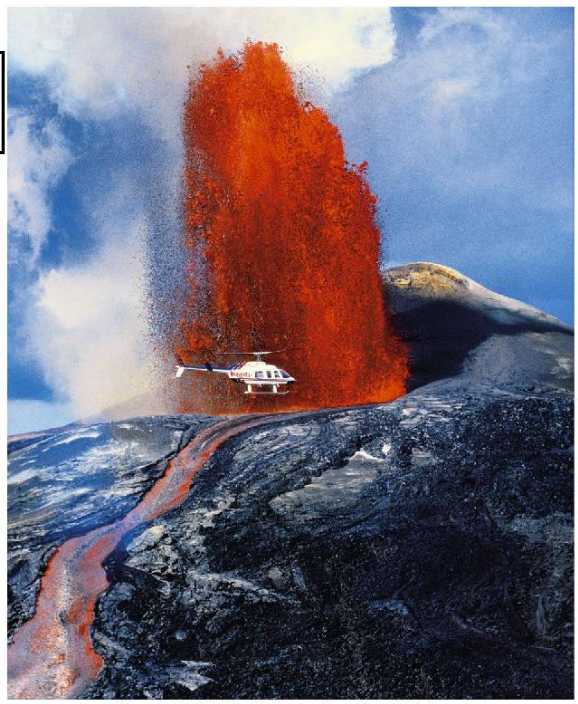
Não-explosivo – tipo escudo, fissural

Explosivo – estrato-vulcão, cones de cinzas

Dependem principalmente da:

- viscosidade do magma
- voláteis dissolvidos no magma

Erupções não explosivas



Vulcões Escudo

(Shield Volcanoes)

- São vulcões muito grandes
- São formados por basaltos de baixa viscosidade
- Perfis suaves, com curvaturas semelhantes a um escudo
- Exemplo: Mauna Loa, Hawai

Vulcão Escudo

(Shield Volcanoes)

Greek, made in Pontis (Turkey), ~ 189 B.C.
Bronze - Shied made for King Pharnakes

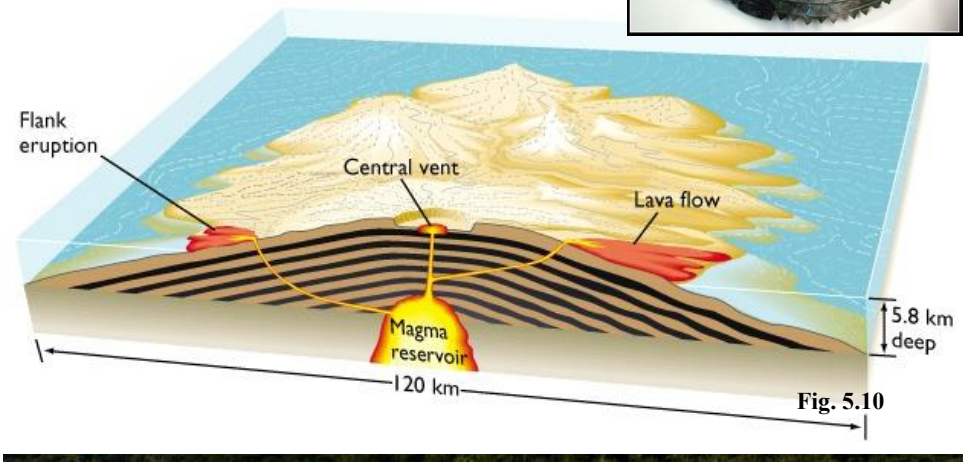
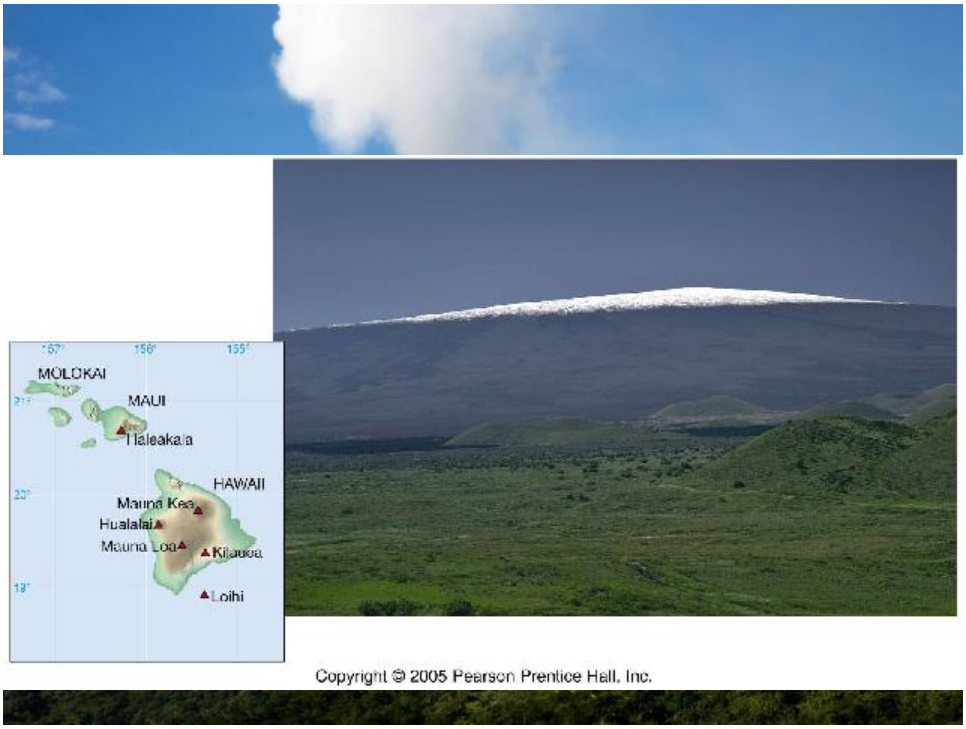


Fig. 5.10


MOLOKAI
MAUI
Haleakala
HAWAII
Mauna Kea
Hualalai
Mauna Loa
Kilauea
Loihi
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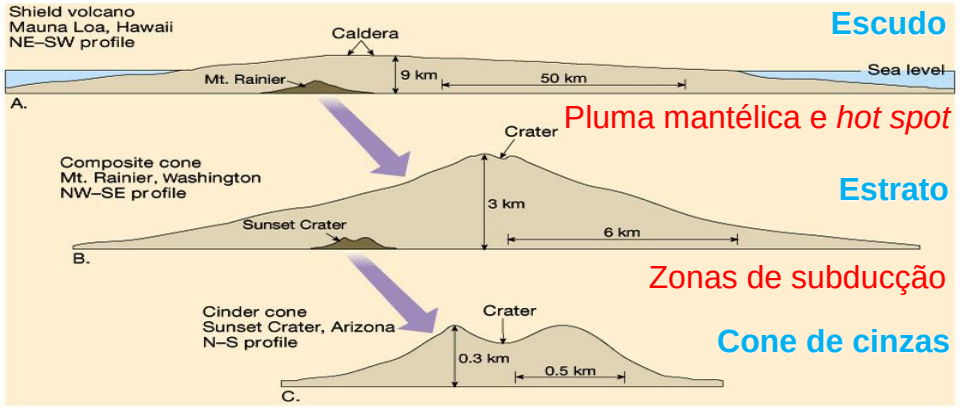
Dimensões dos Vulcões

Dimensões dos principais tipos de vulcões



Escudo

Pluma mantélica e *hot spot*

Estrato

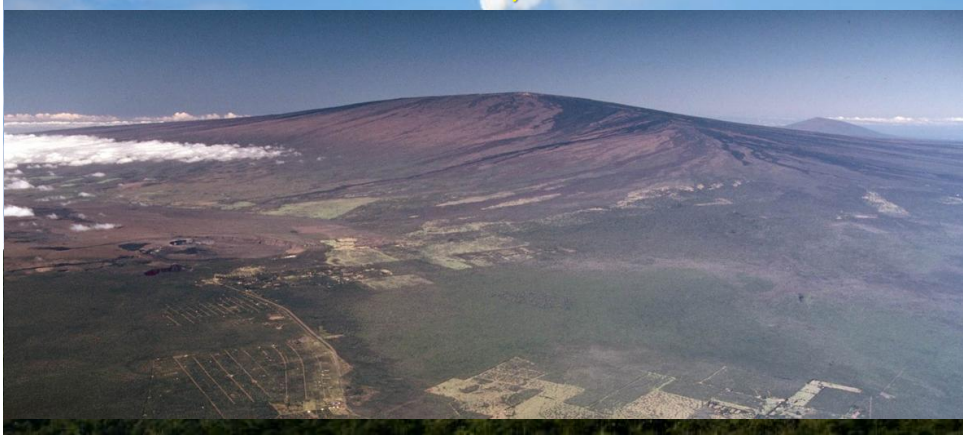
Zonas de subducção

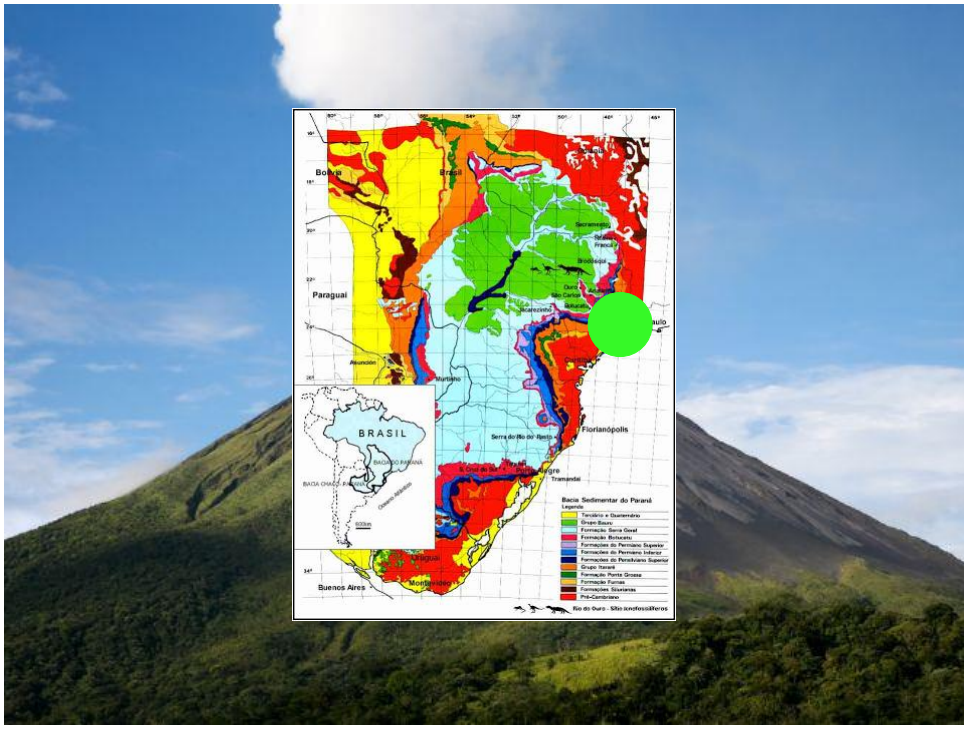
Cone de cinzas

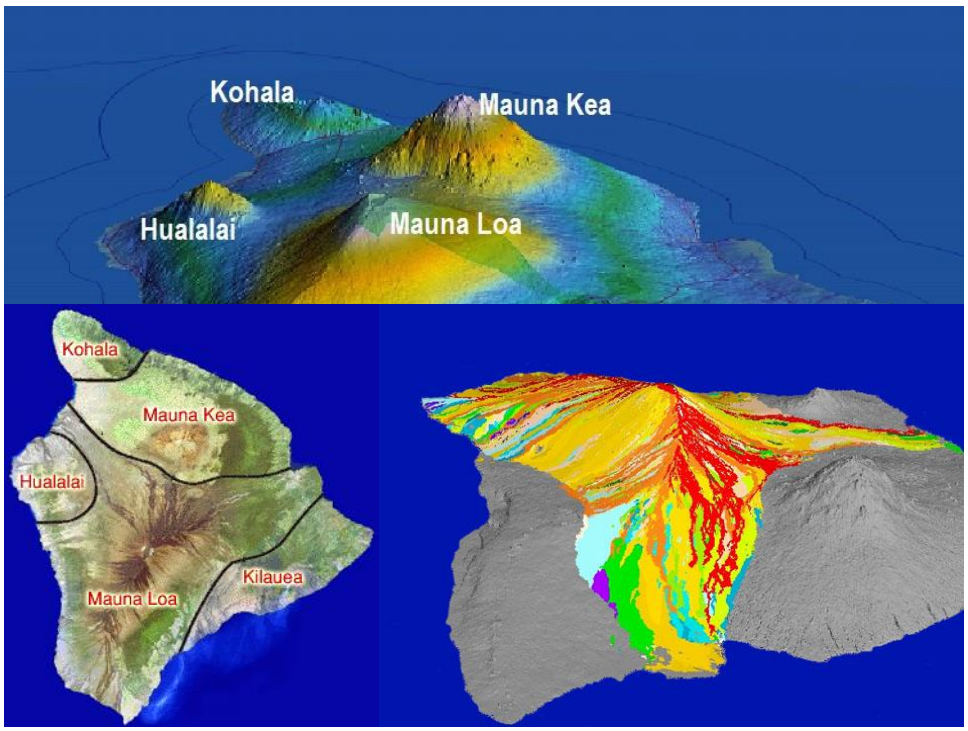
Zonas trativas

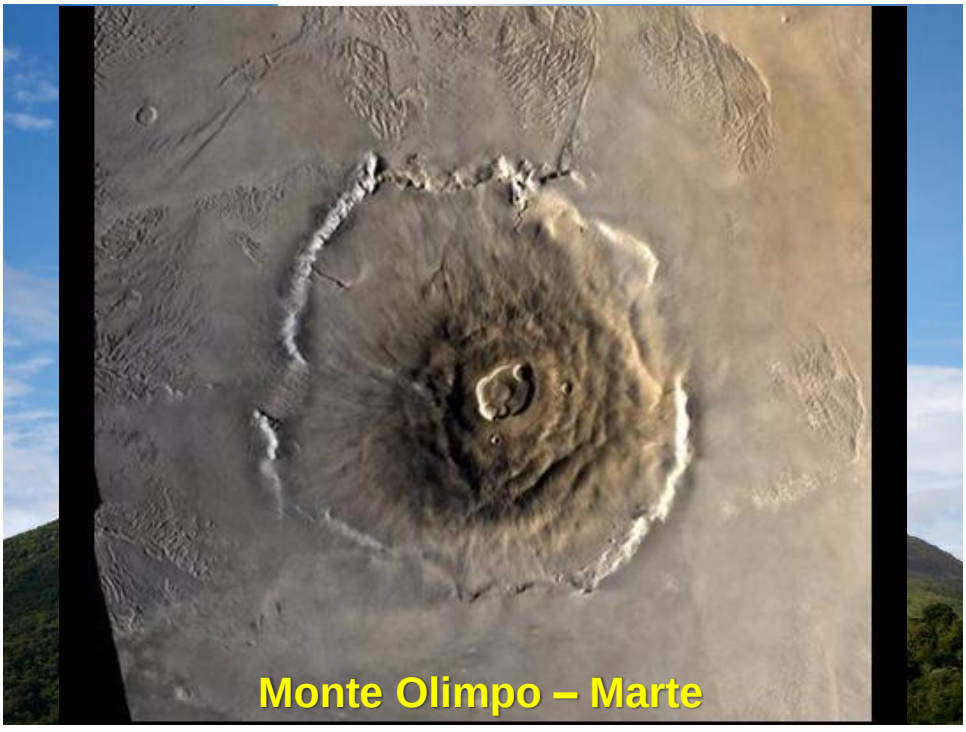
Mauna Loa, Hawai

- 120 x 103 km em planta - (Ilha do Hawai - 250 x 100 km)
- 4,17 km de altura da superfície
+ 5 km até o fundo do mar = 9,17 km



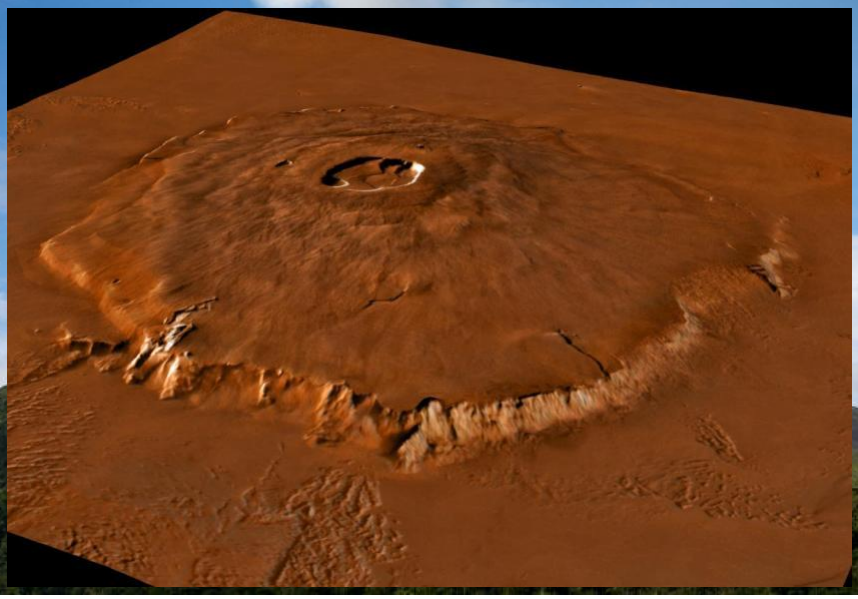

Bolívia
Brasil
Paraguai
Buenos Aires
Montevidéu
Florianópolis
BRASIL
Bacia Sedimentar do Paraná

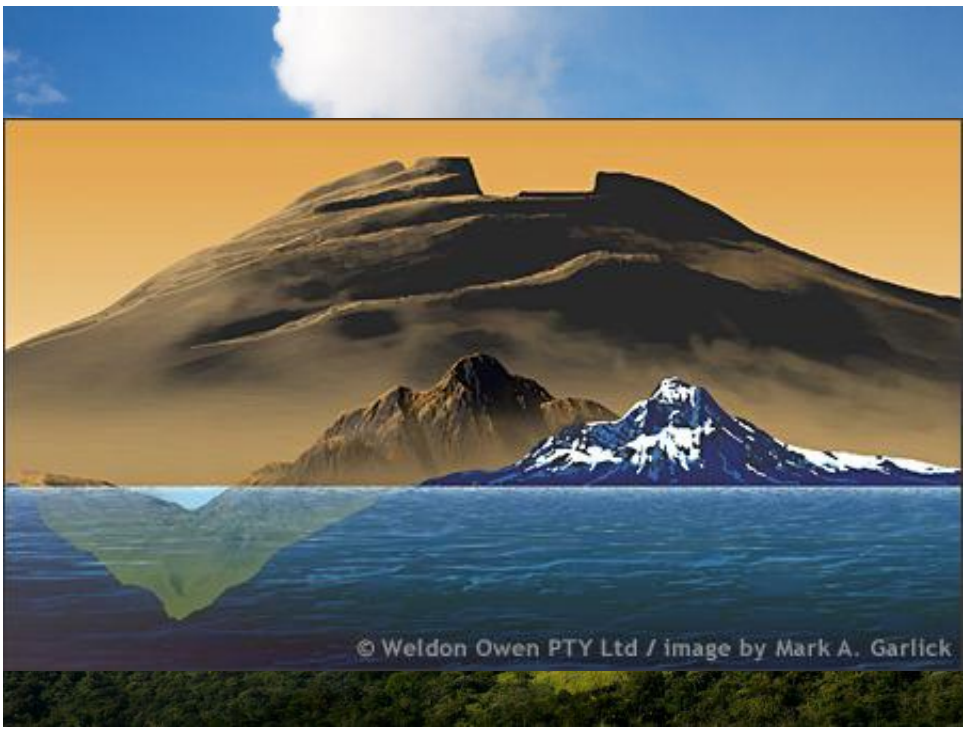

Kohala
Mauna Kea
Hualalai
Mauna Loa
Kohala
Mauna Kea
Hualalai
Kilauea
Mauna Loa


Monte Olimpo – Marte

Monte Olimpo – Marte

624 km de diâmetro e 27 km de altura

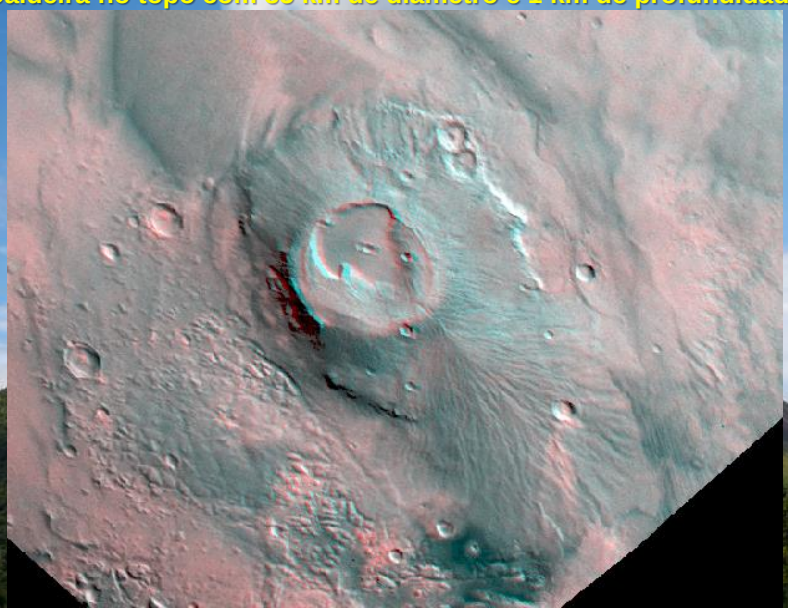




Apollinaris Patera – Marte

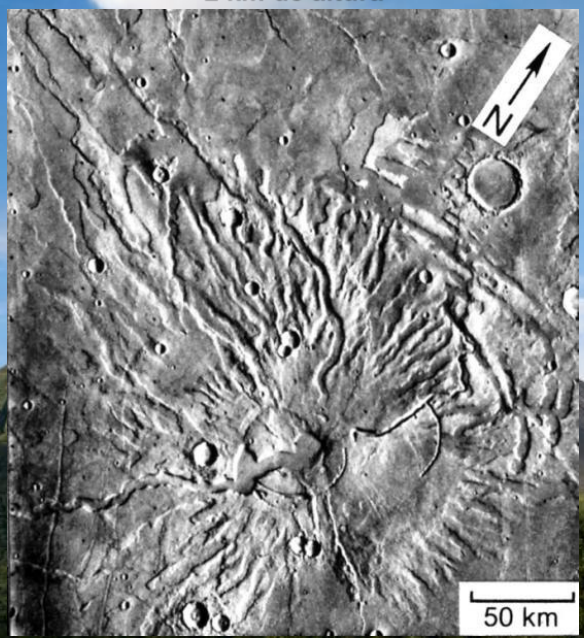
180 x 250 x 5 km

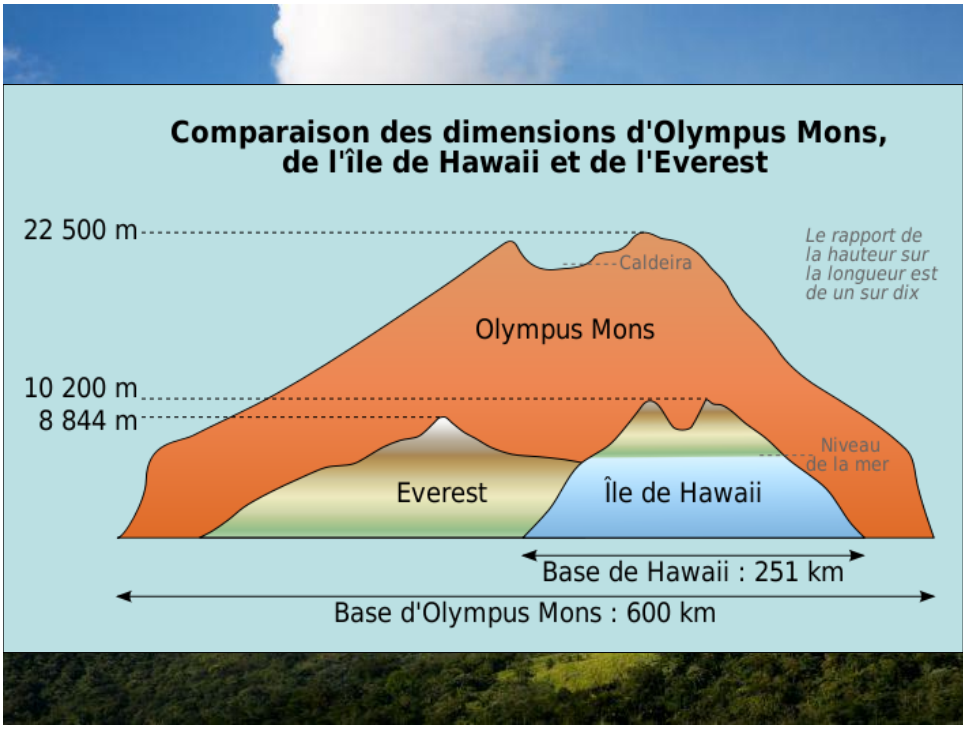
Caldeira no topo com 85 km de diâmetro e 1 km de profundidade



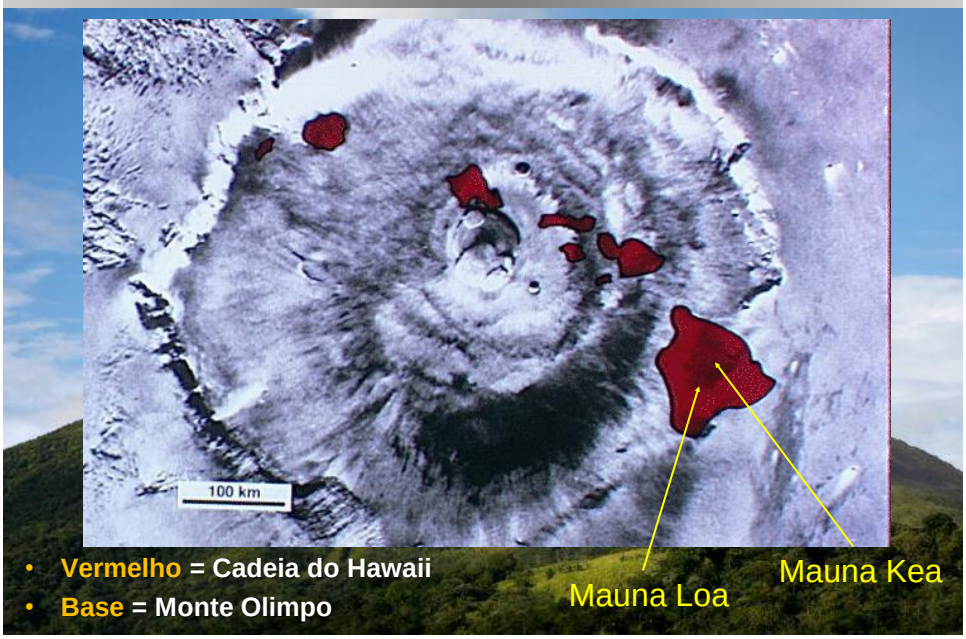
Tyrrhena Patera – Marte

2 km de altura





Vulcões Escudo - Terra vs. Marte



- **Vermelho** = Cadeia do Hawaii
- **Base** = Monte Olimpo

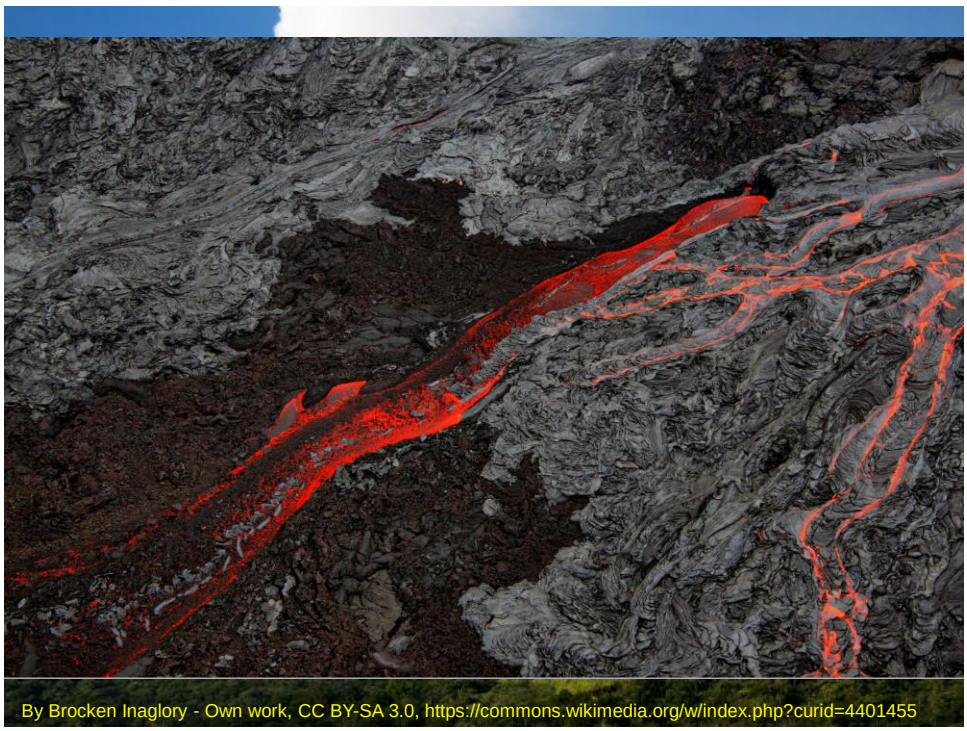
Tipos of lava basáltica

- **A'a: derrames espessos e bem definidos**
- **Pahoehoe: derramas com fina crosta rugosa**
- ***Pillow* lava: derrames subaquáticos com tubos que resultam em formas arredondadas nos corte perpendiculares**
- **Lava Blocosa: lava mais fria, com formas irregulares quando consolidada**

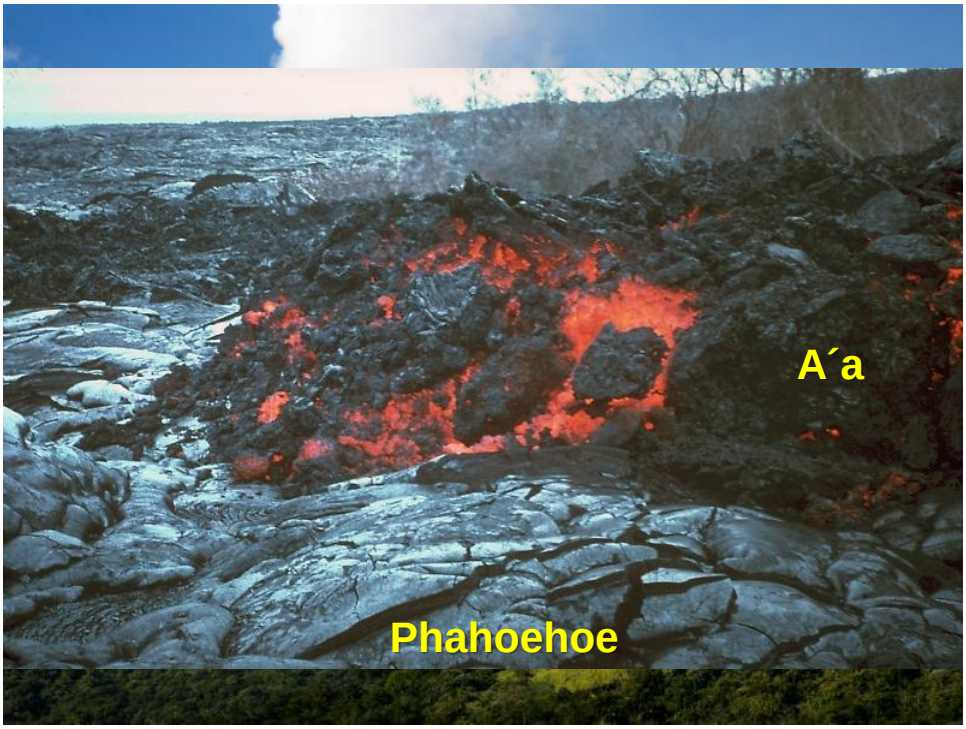
A´a

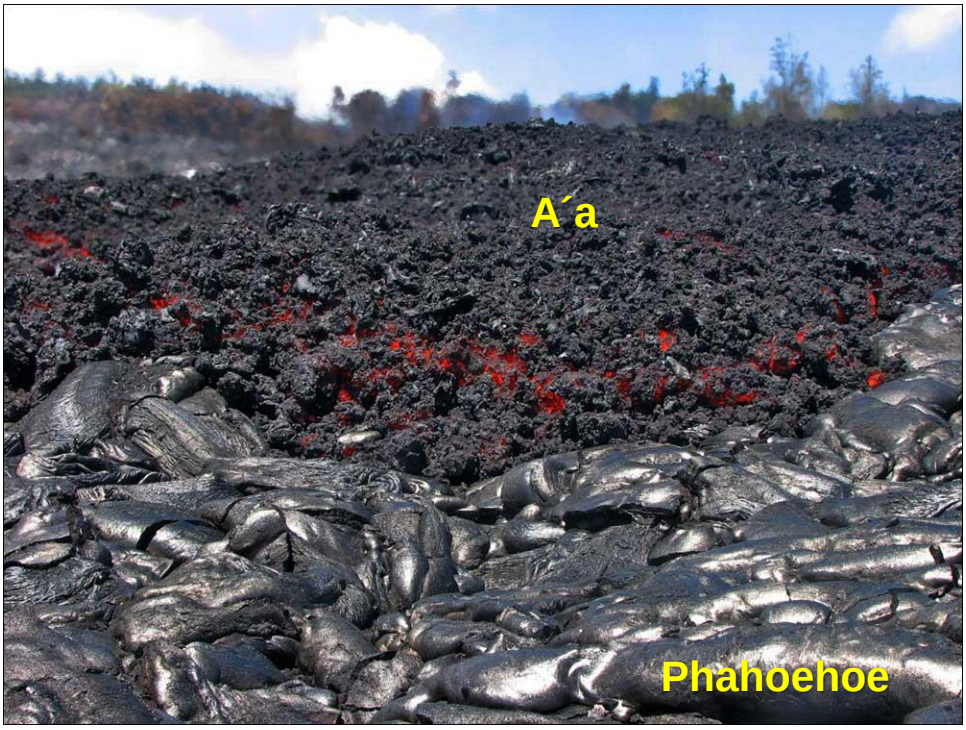
A'a lava flow May 6, 2018 Leilani Estates, Hawaii

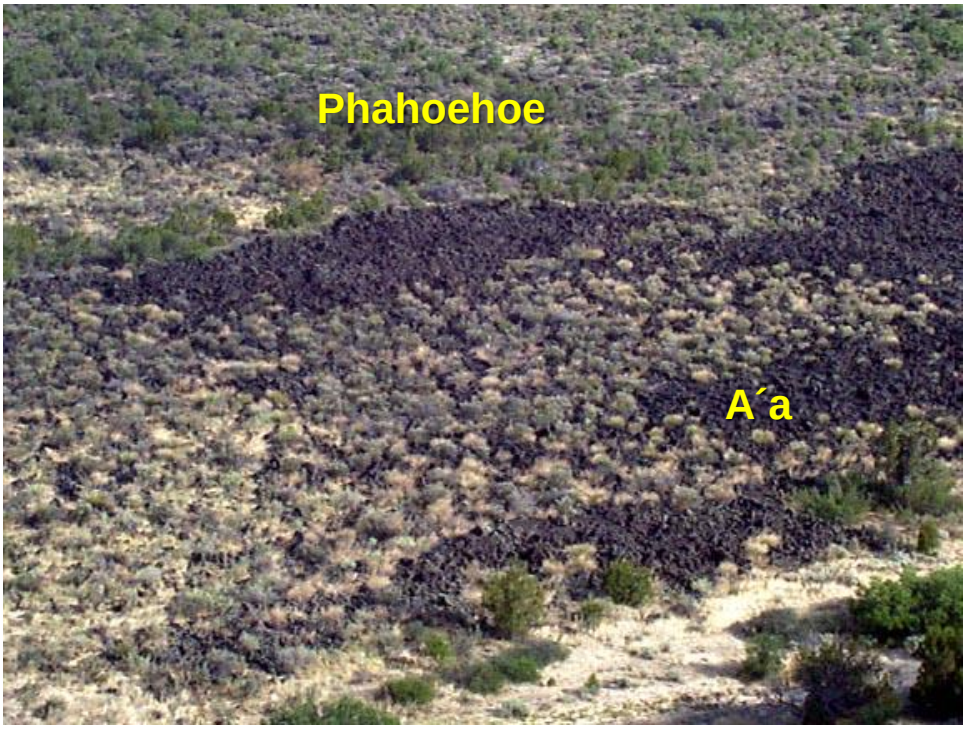
Lava. Ropy pahoehoe. Kilauea Volcano, Hawaii. 06-11-1995. Tari Noelani Matlox, USGS



By Brocken Inaglory - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=4401455


A´a
Phahoehoe


A´a
Phahoehoe



Lava Blocosa (*Blocky lava*)


Lava Blocosa
(Blocky lava)
STOP

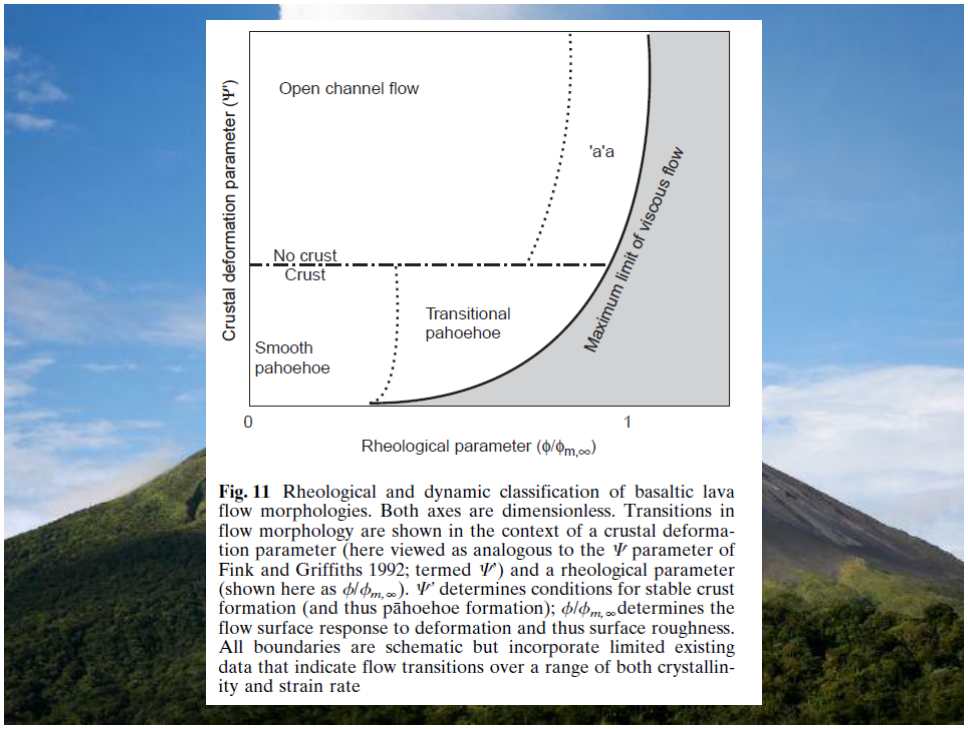
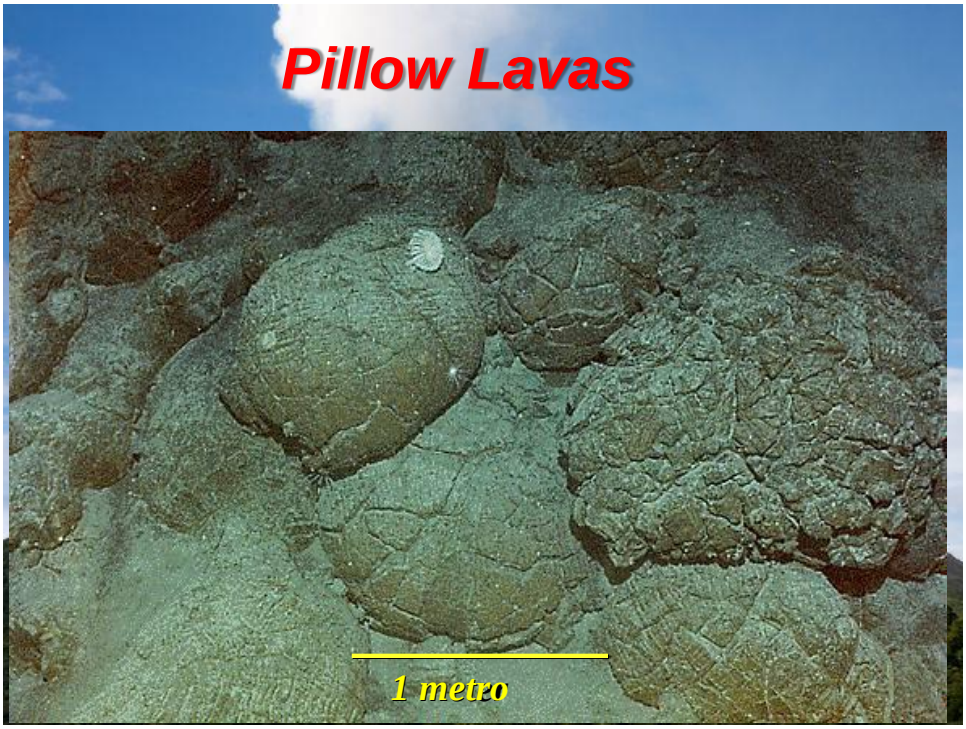
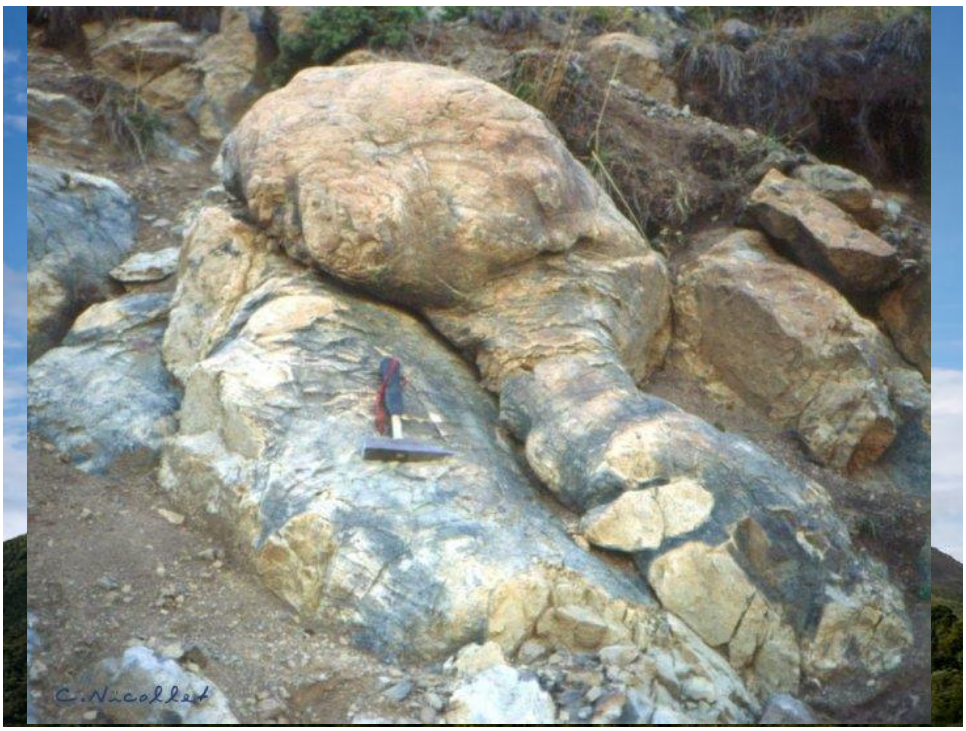


Fig. 11 Rheological and dynamic classification of basaltic lava flow morphologies. Both axes are dimensionless. Transitions in flow morphology are shown in the context of a crustal deformation parameter (here viewed as analogous to the Ψ parameter of Fink and Griffiths 1992; termed Ψ') and a rheological parameter (shown here as $\phi/\phi_{m,\infty}$). Ψ' determines conditions for stable crust formation (and thus pāhoehoe formation); $\phi/\phi_{m,\infty}$ determines the flow surface response to deformation and thus surface roughness. All boundaries are schematic but incorporate limited existing data that indicate flow transitions over a range of both crystallinity and strain rate

Pillow Lavas





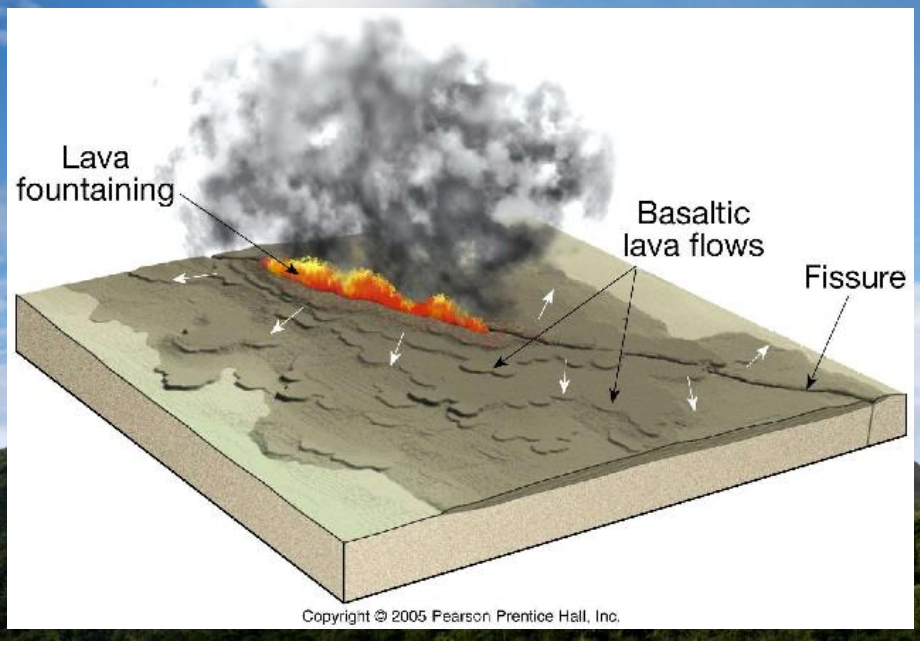

Hajar Mountains of Oman


C. Nicollet

Erupções Fissurais

- São muito grandes, formam lençóis de lavas a partir de grande fendas, com diversos vulcões ao longo da zona de extrusão
- Forma principalmente derrames de basaltos
- Exemplos: *Columbia river basalts*, Bacia do Paraná, Islândia

Derrames Fissurais



Erupções fissurais e *Plateaus* de lavas

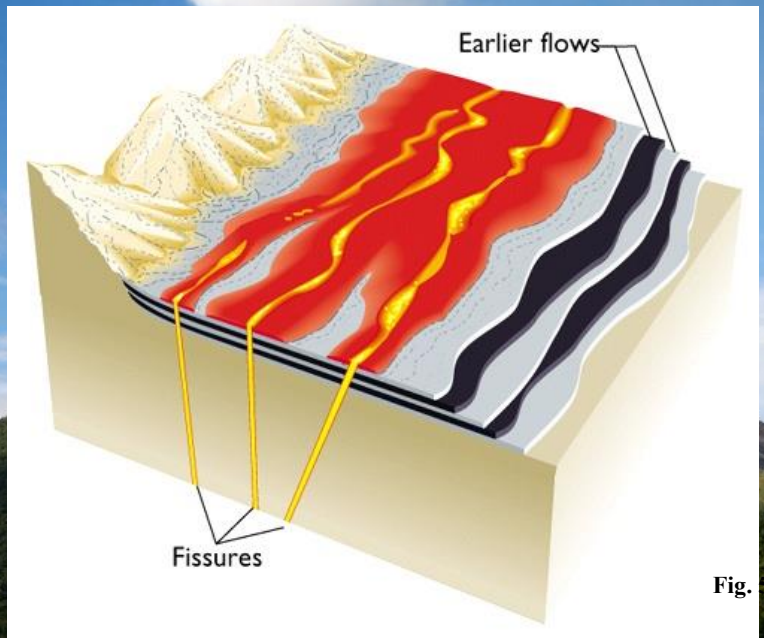


Fig. 5.20

Erupção Fissural em 1971, Kilauea, Hawaii

Islândia


Islândia


Islândia

Fissura Laki formada pela erupção de 1783–1784, Islândia

42 Bt de basalto e nuvens de ácido fluorídrico e 120 Mt de SO_2

Ao fundo os vulcões Katla (esquerda) e Eyjafjallajökull (direita) cobertos por geleiras

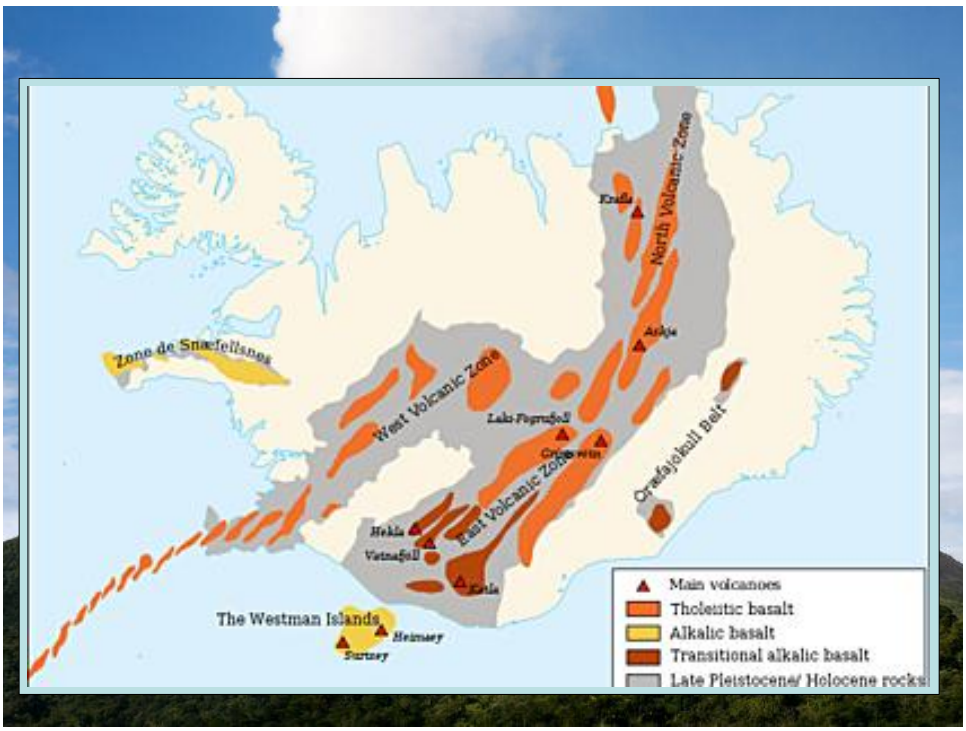


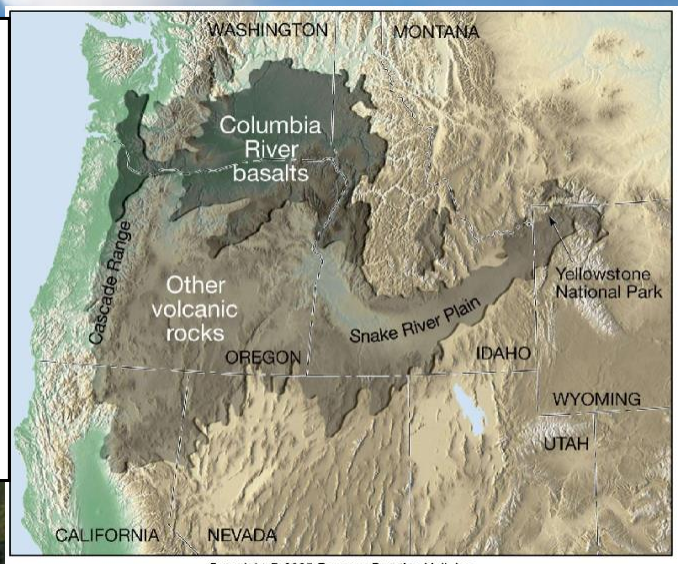
Fig. 5.22

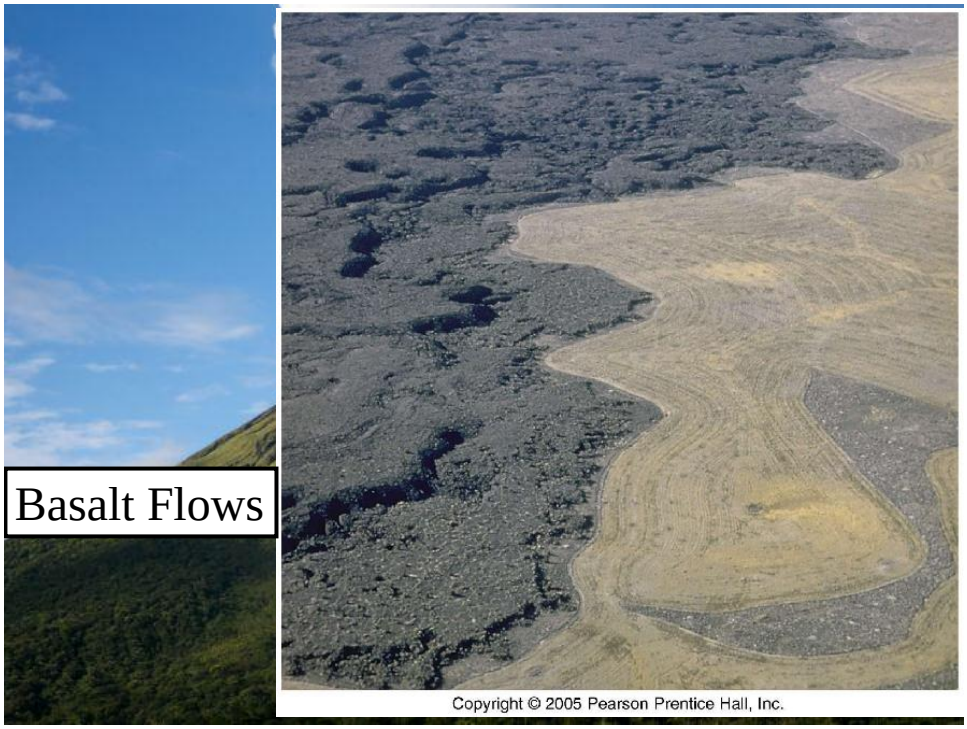
14-16 Ma

3.500 m de espessura

300 derrames individualizados

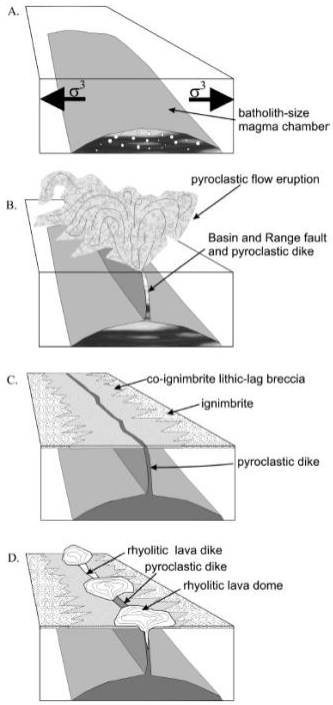
Cobre 164.000 km²



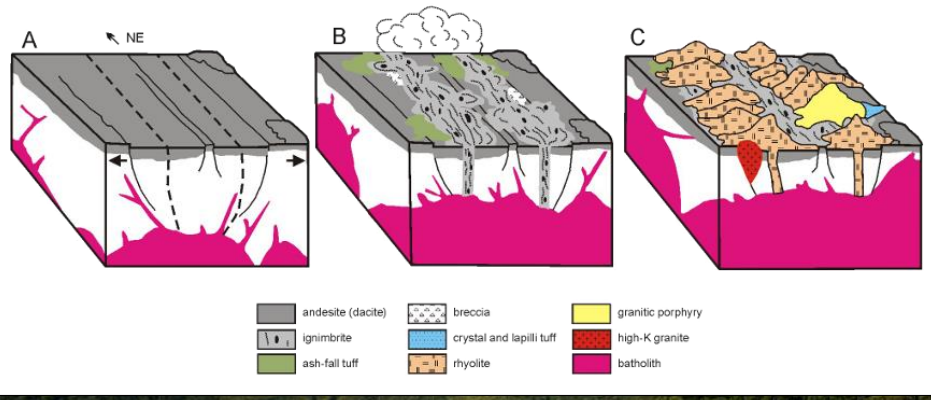


Columbia Plateau Flow Basalts

Ignimbritos Fissurais
Sierra Madre Ocidental
Aguirre-Dias & Labarthe-Hernandes (2003)



Ignimbritos fissurais
São Félix do Xingu – Amazônia (1,88 Ga)



Juliani & Fernandes (2010)

Vulcanismo Explosivo

Volcanic Explosivity Index (VEI)

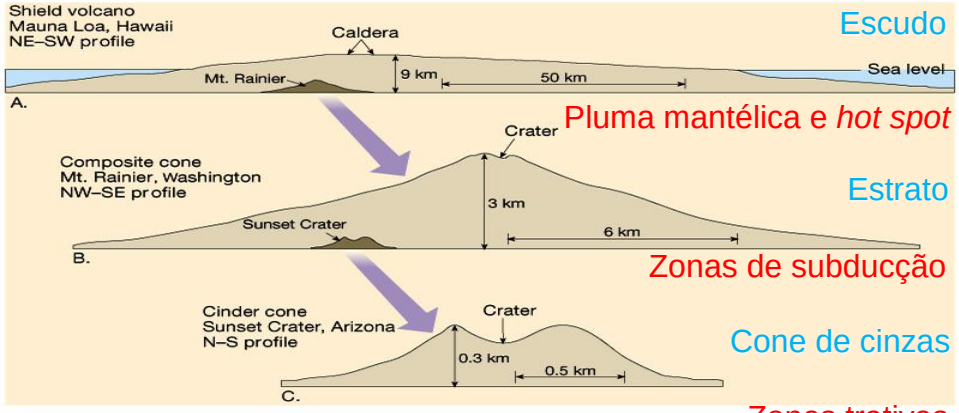
VEI	Description	Plume Height	Volume	Classification	How often	Example
0	non-explosive	<100 m	1,000 m^3	Hawaiian	daily	Kilauea
1	gentle	100-1000 m	10,000 m^3	Haw/Strombolian	daily	Stromboli
2	explosive	1-5 km	1,000,000 m^3	Strom/Vulcanian	weekly	Galeras, 1992
3	severe	3-15 km	10,000,000 m^3	Vulcanian	yearly	Ruiz, 1985
4	cataclysmic	10-25 km	100,000,000 m^3	Vulc/Plinian	10's of years	Galunggung, 1982
5	paroxysmal	>25 km	1 km^3	Plinian	100's of years	St. Helens, 1981
6	colossal	>25 km	10 km^3	Plin/Ultra-Plinian	100's of years	Krakatau, 1883
7	super-colossal	>25 km	100 km^3	Ultra-Plinian	1000's of years	Tambora, 1815
8	mega-colossal	>25 km	1,000 km^3	Ultra-Plinian	10,000's of years	Yellowstone, 2 Ma

Estrato-vulcões ou Vulcões compostos

(*Stratovolcanoes* ou *Composite Volcano*)

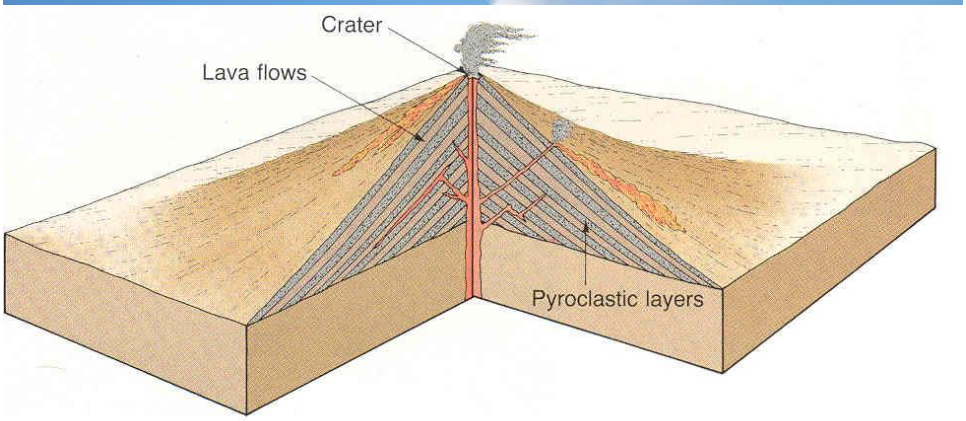
- Flancos inclinados, tendem formar cones simétricos
- Formados por alternâncias de camadas de de lavas e de piroclásticas
- Predominantemente gerados por magmas andesíticos e dacíticos
- Exemplos: Fujiyama, Japão; Mt. Santa Helena, WA

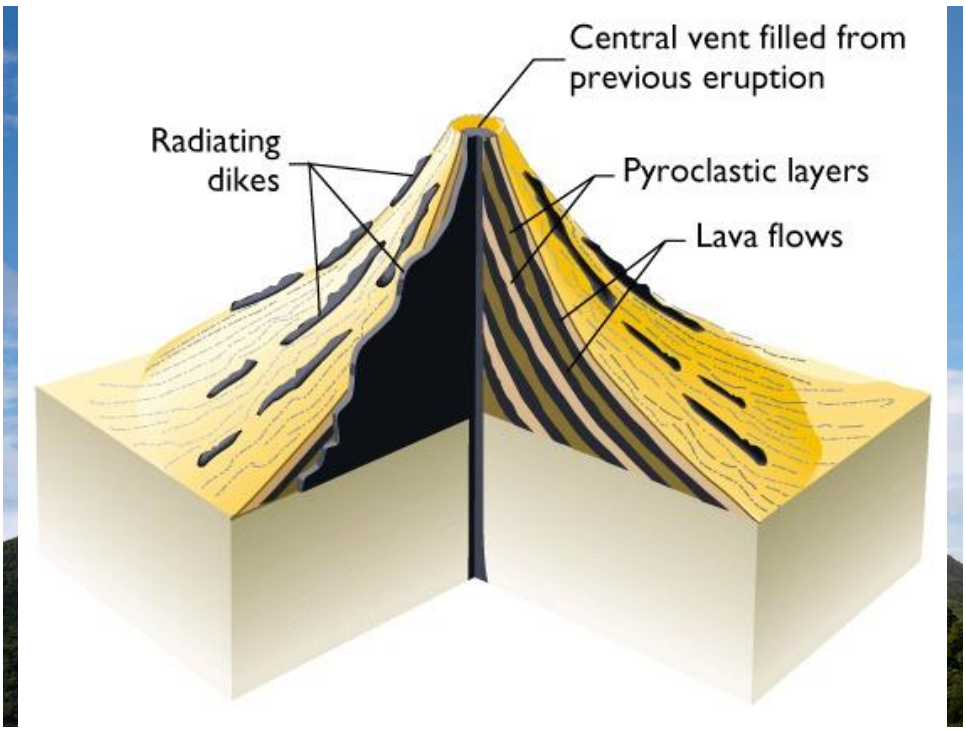
Dimensões dos principais tipos de vulcões

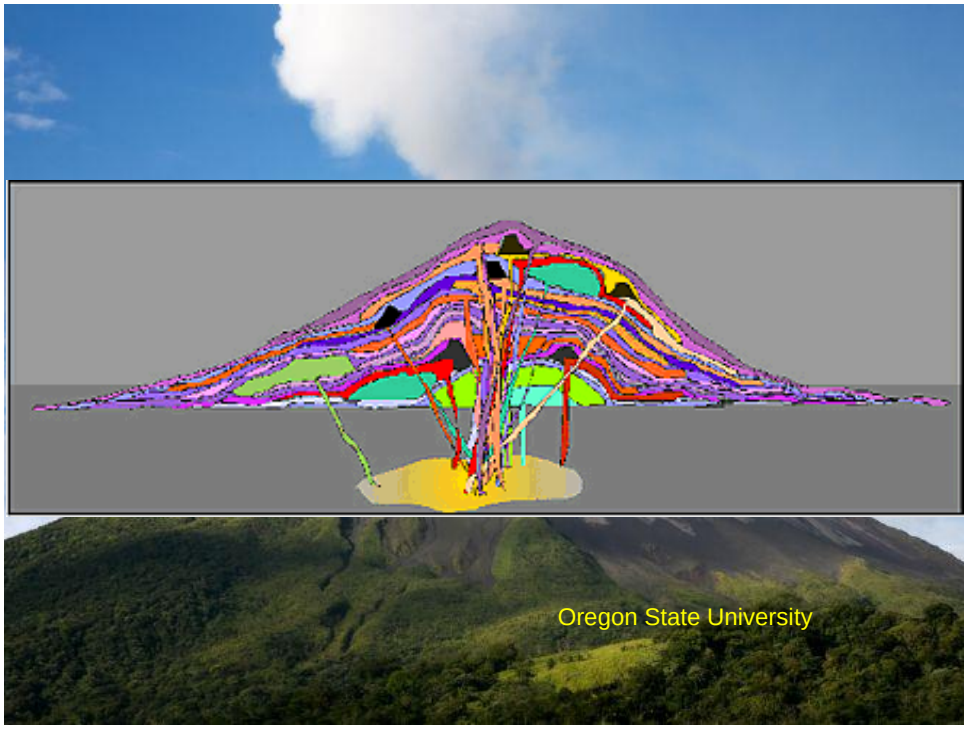


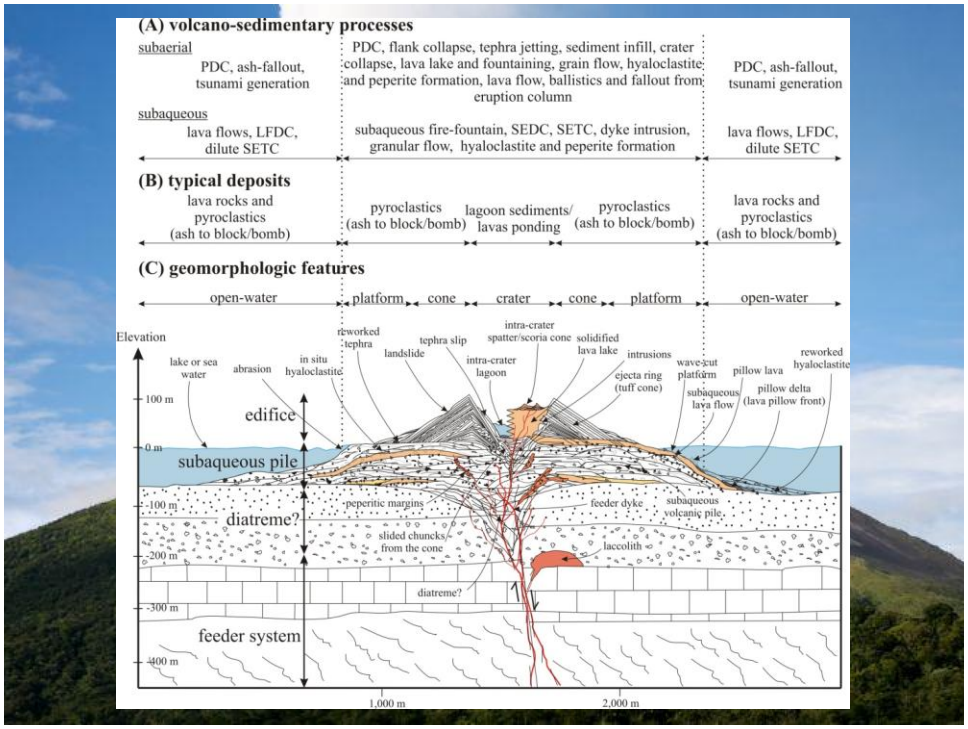
Estrato-vulcões

(ou vulcões compostos)





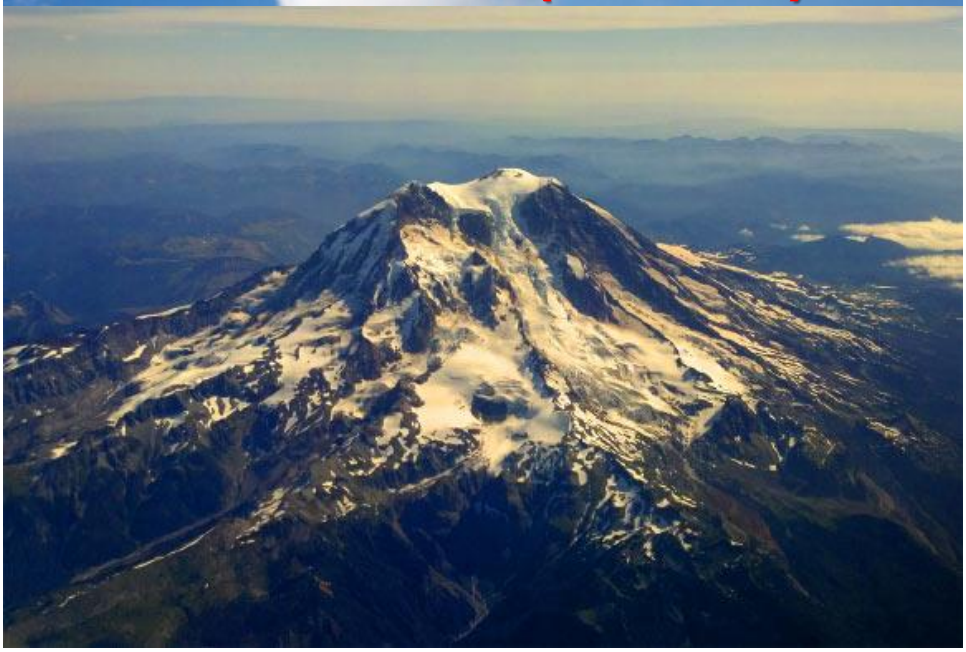

Oregon State University


(A) volcano-sedimentary processes
subaerial
PDC, ash-fallout, tsunami generation
PDC, flank collapse, tephra jetting, sediment infill, crater collapse, lava lake and fountaining, grain flow, hyaloclastite and peperite formation, lava flow, ballistics and fallout from eruption column
PDC, ash-fallout, tsunami generation
subaqueous
lava flows, LFDC, dilute SETC
subaqueous fire-fountain, SEDC, SETC, dyke intrusion, granular flow, hyaloclastite and peperite formation
lava flows, LFDC, dilute SETC
(B) typical deposits
lava rocks and pyroclastics (ash to block/bomb)
pyroclastics (ash to block/bomb)
lagoon sediments/ lavas ponding
pyroclastics (ash to block/bomb)
lava rocks and pyroclastics (ash to block/bomb)
(C) geomorphologic features
open-water
platform
cone
crater
cone
platform
open-water
Elevation
lake or sea water
abrasion
in situ hyaloclastite
reworked tephra
landslide
tephra slip
intra-crater spatter/scoria cone
intra-crater lagoon
solidified lava lake
intrusions
ejecta ring (tuff cone)
wave-cut platform
pillow lava
subaqueous lava flow
pillow delta (lava pillow front)
reworked hyaloclastite
100 m
edifice
0 m
subaqueous pile
-100 m
diatreme?
peperitic margins
feeder dyke
subaqueous volcanic pile
slided chuncks from the cone
laccolith
-200 m
diatreme?
-300 m
feeder system
-400 m
1,000 m
2,000 m

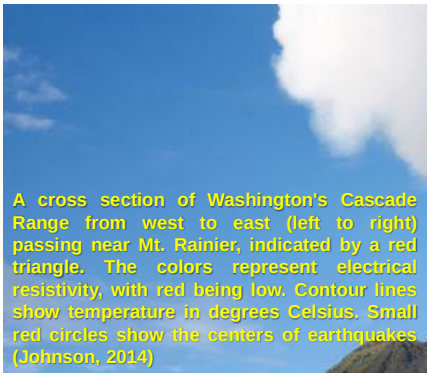
Vulcão Arenal – Costa Rica

Fujiyama (Japão)

Monte Rainier (WA-EUA)



Monte Rainier - cidade de Tacoma (EUA)



A cross section of Washington's Cascade Range from west to east (left to right) passing near Mt. Rainier, indicated by a red triangle. The colors represent electrical resistivity, with red being low. Contour lines show temperature in degrees Celsius. Small red circles show the centers of earthquakes (Johnson, 2014)

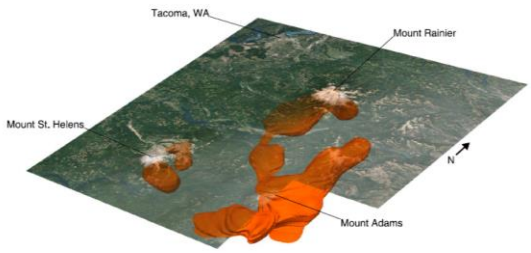
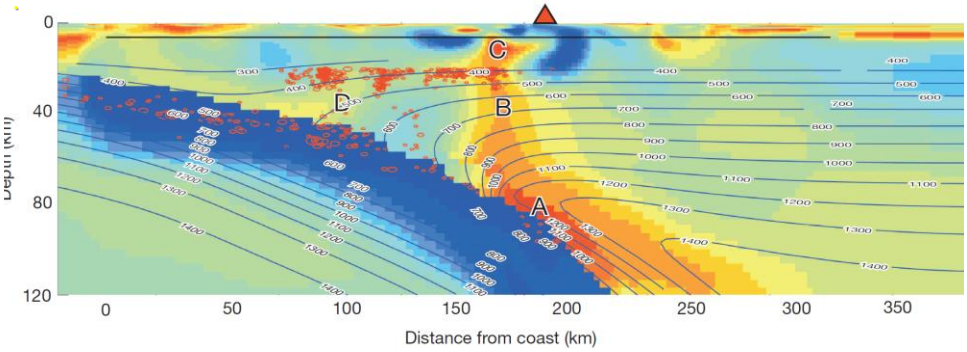


Figure 5. Aerial Image of Southwest Washington and 7% Slow V_s Isosurface (~6% melt). The SWC-LVZ defined by the >7% slow V_S isosurface, equivalent to ~6% partial melt (volume/melt-fractions calculations exclude the WRSZ and Mount Rainier magma reservoir). Additional slow bodies are shown for Mount Rainier's/St. Helen's magmatic system, the WRSZ, and the SHZ. The city of Tacoma Washington is seen to the northwest. Imagery available from the U.S. Geological Survey. Figure made with Generic Mapping Tools[49] (GMT) v.5.2.

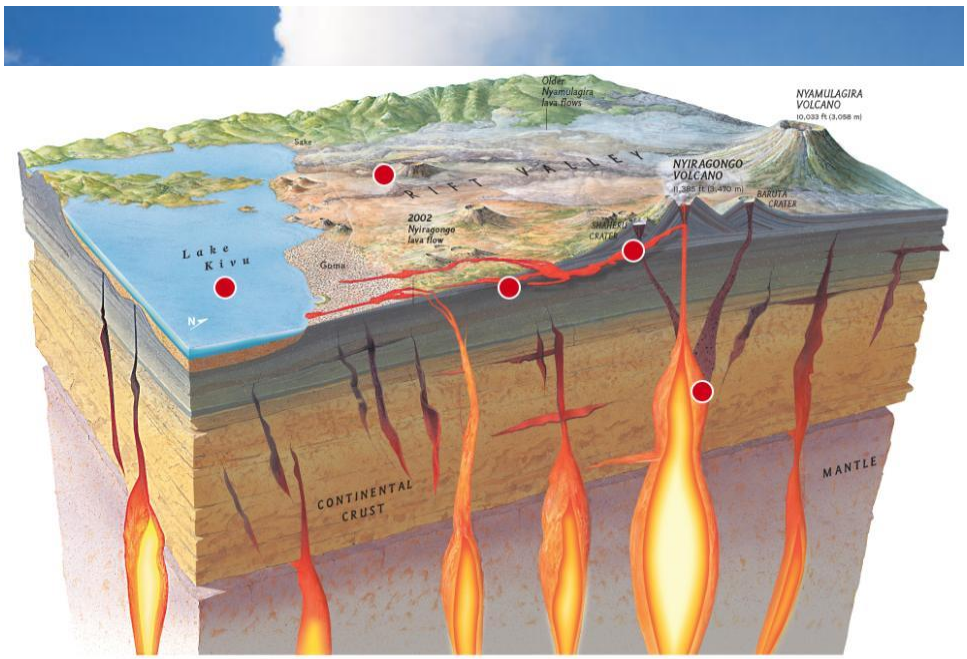


Lago de Lava (*Lava lake*)

Nyiragongo (República do Congo)

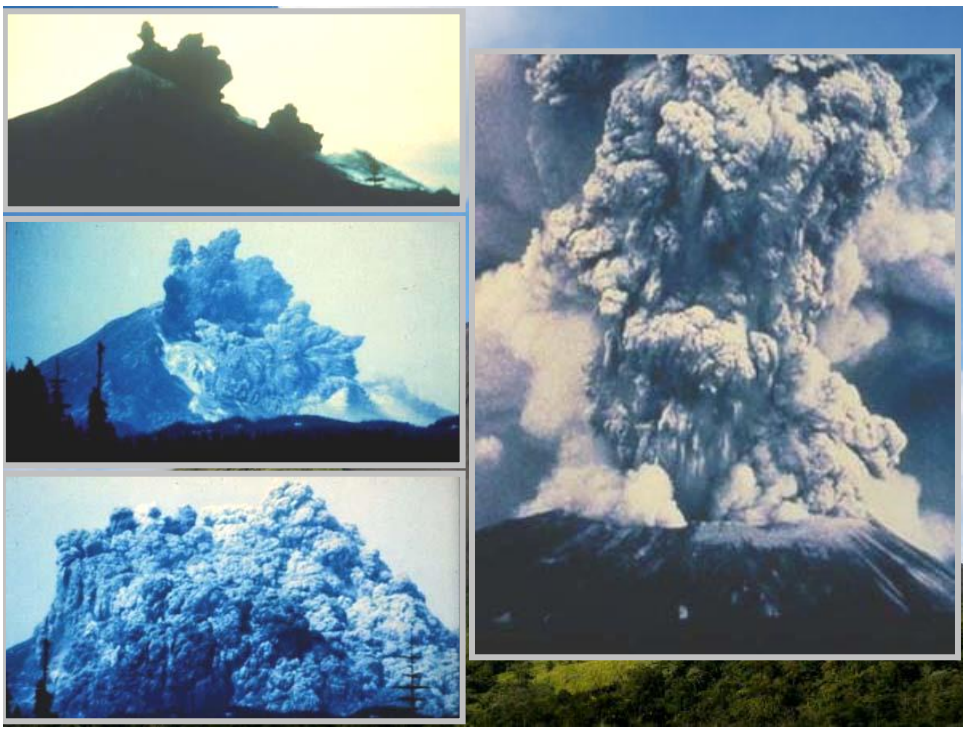
https://www.youtube.com/watch?v=fXo3YHoUF0o&ab_channel=FOBOSPLANET

https://www.youtube.com/watch?v=ZVBEFHwzEWQ&ab_channel=AmazingPlacesonOurPlanet

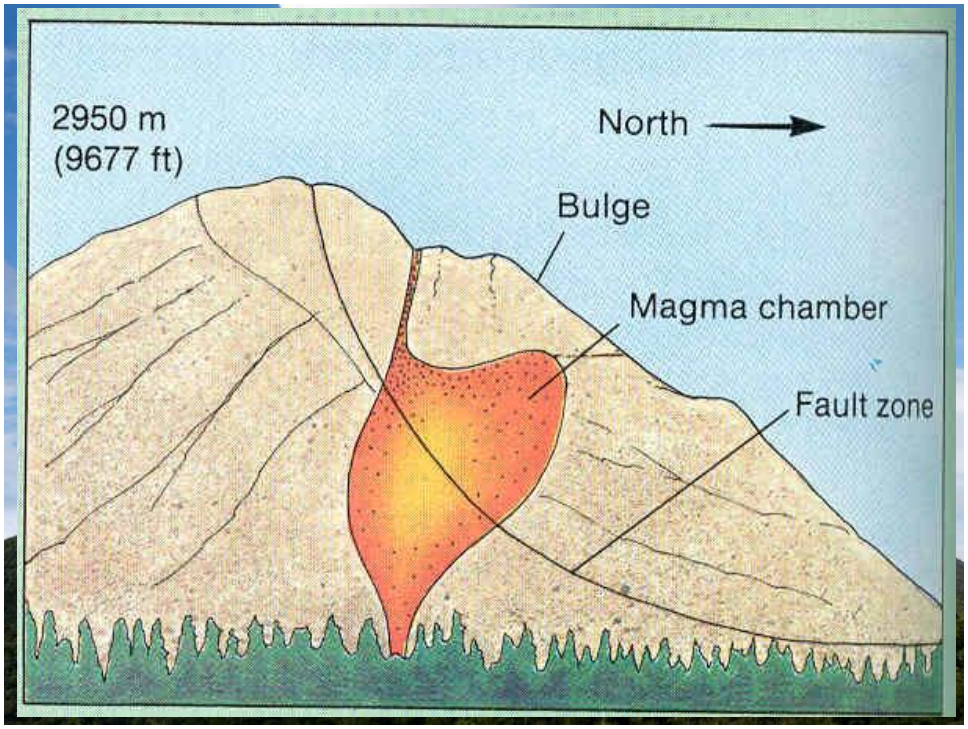


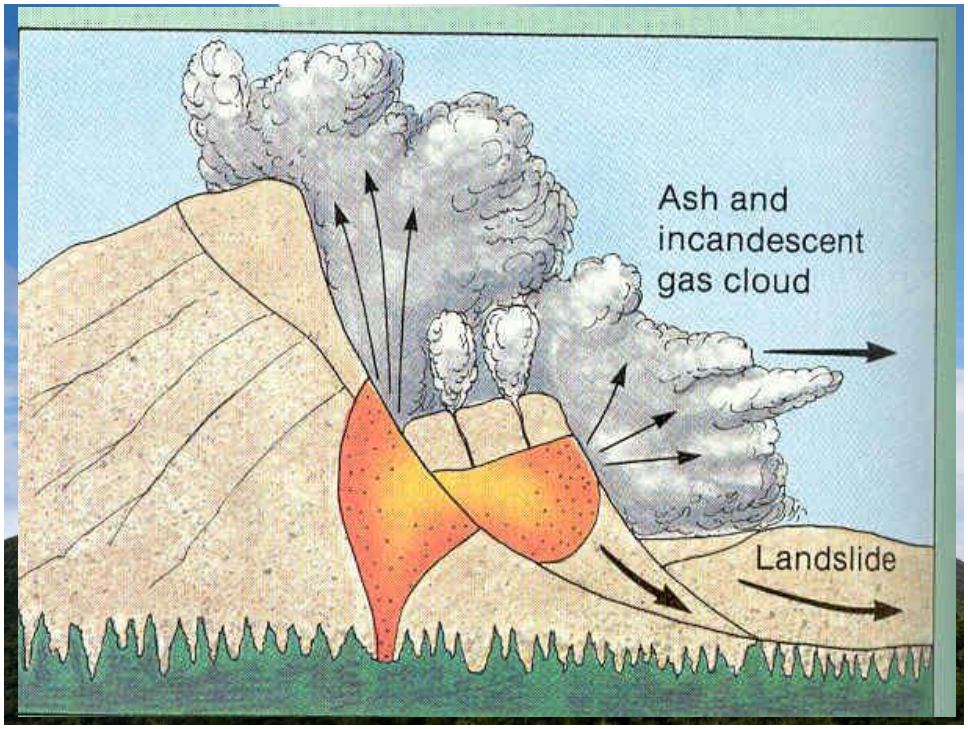
WILLIAM E. MCNULTY AND LISA R. RITTER, NGM STAFF. ART: GARY HINCKS
SOURCES: DARIO TEDESCO, UNITED NATIONS OFFICE FOR PROJECT SERVICES AND SECOND UNIVERSITY OF NAPLES; KLAUS TIETZE, GAS-BEARING LAKES AND OCEAN BASINS CONSULTANCY, PDT GMBH

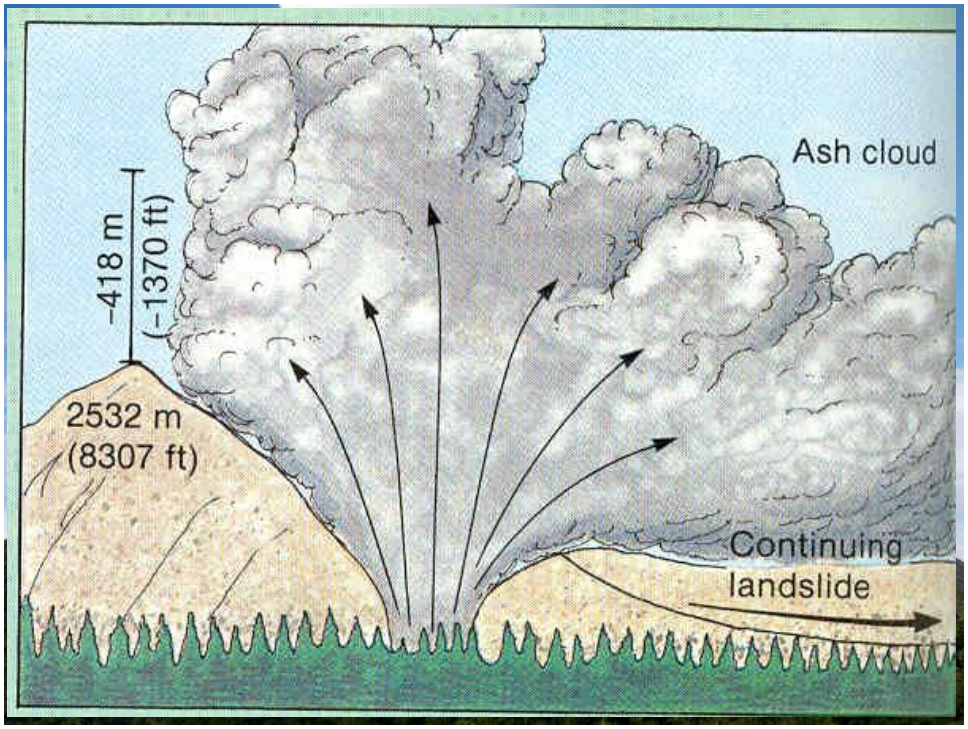
Monte Santa Helena, antes de maio de 198




Depois de 1980
David Weintraub/Photo Researchers


2950 m
(9677 ft)
North
Bulge
Magma chamber
Fault zone


Ash and
incandescent
gas cloud
Landslide


Ash cloud
418 m
(1370 ft)
2532 m
(8307 ft)
Continuing
landslide

Lahars

Fluxo de lamas vulcânicas (*volcanic mudflows*)

Lahars


Univ WA, Jerry Franklin

Cones de Cinzas

(*Cinder Cone*)

- São cones vulcânicos relativamente pequenos formados por materiais piroclásticos inconsolidados
- Podem ser formados por magmas basálticos, andesíticos ou riolíticos
- Curtos períodos de atividade
- Exemplo: Paricutin (México)

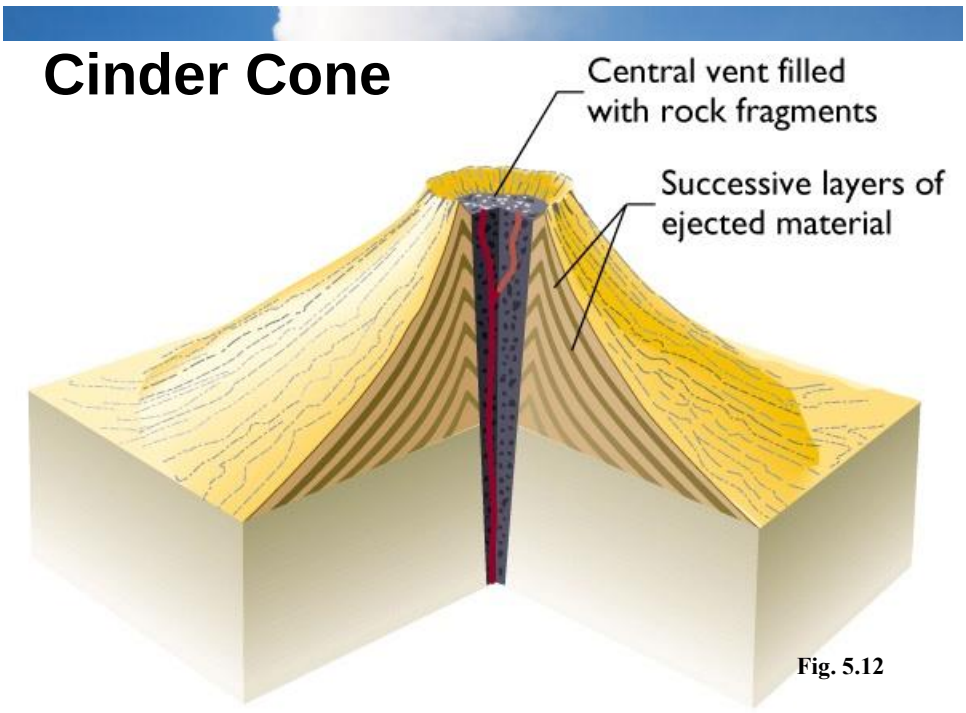
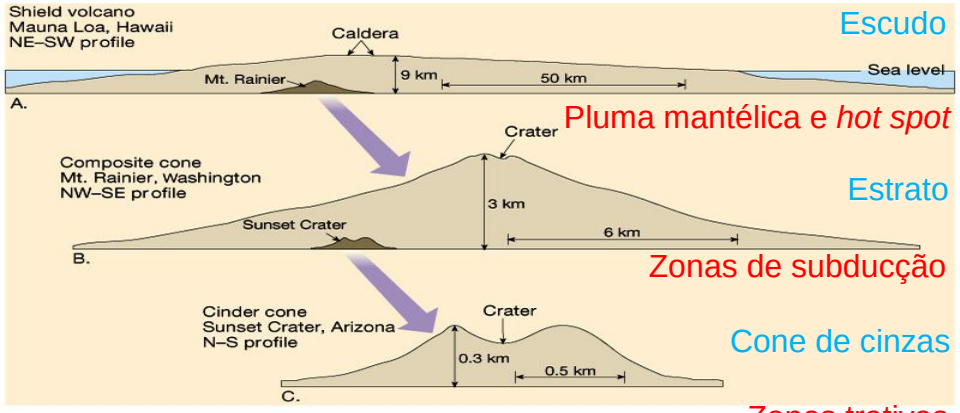


Fig. 5.12

Dimensões dos principais tipos de vulcões



Escudo

Pluma mantélica e *hot spot*

Estrato

Zonas de subducção

Cone de cinzas

Zonas trativas

Paricutin (México)

Paricutin (México)

Cerro Negro Cinder Cone

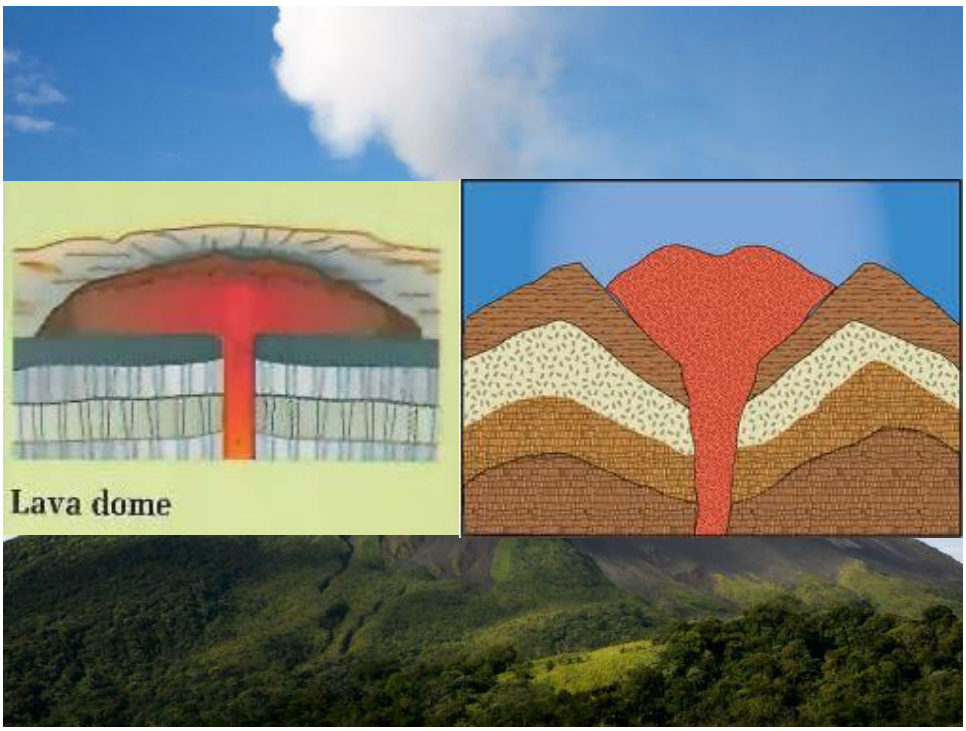
Managua, Nicaragua 1968

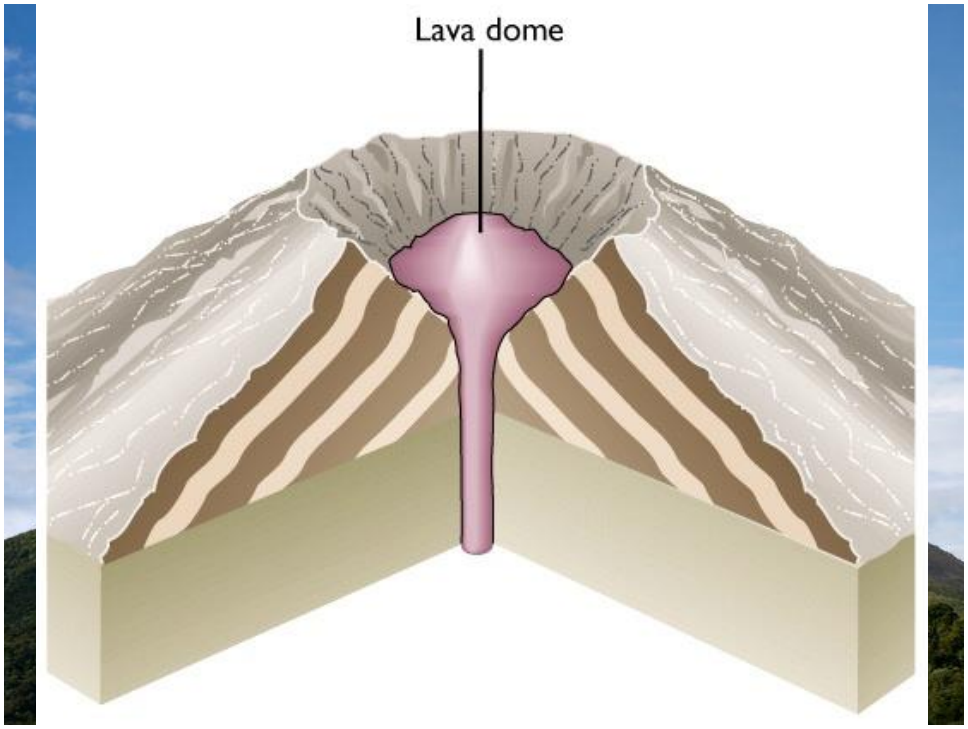
Sunset Crater (Arizona)

Domos Vulcânicos ou Domos de Lavas

(*Volcanic Domes* ou *Lava Domes*)

- São corpos pequenos de lavas e vulcanoclásticas, com forma de domo ou de uma taça invertida
- Usualmente formados por riolito
- Examplo: Domo de lava na cratera do Monte Santa Helena




Lava dome

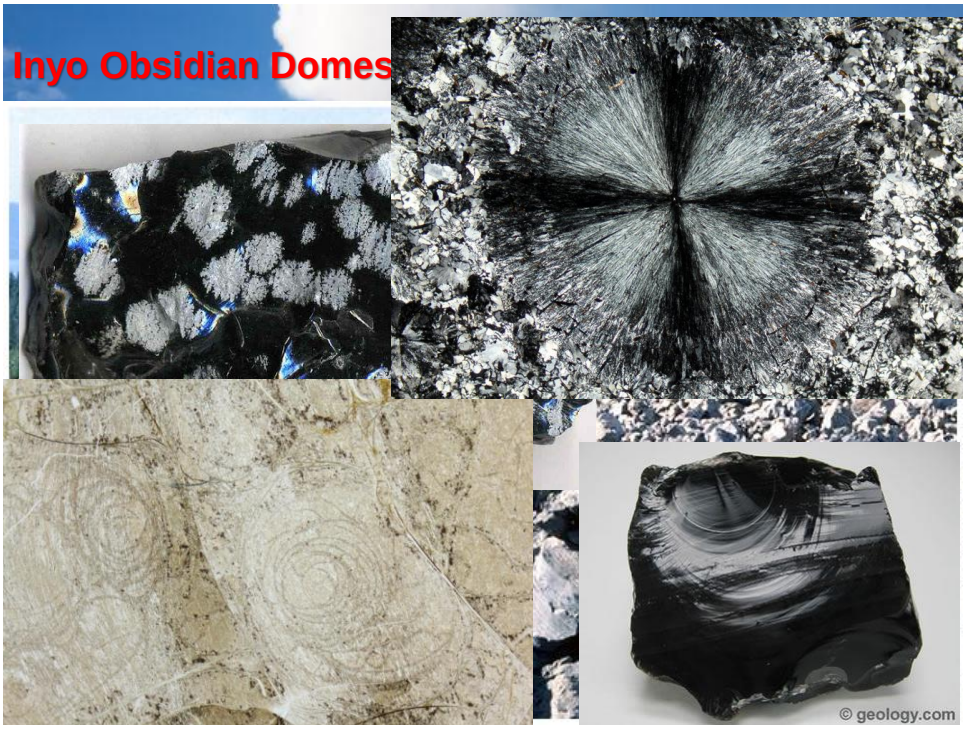

Monte Santa Helena
Domo de lava
Lyn Topinka/USGS

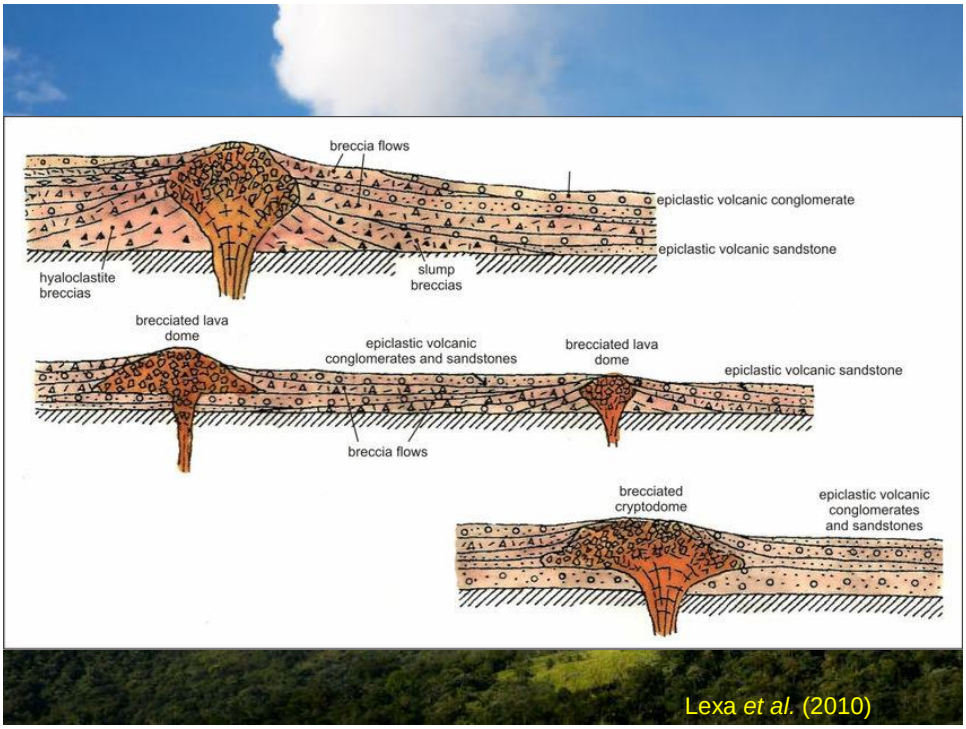
Domo no Monte Santa Helena (300 x 34 m), com seis dias após o início da erupção

Domo vulcânico Kelud, Java, Indonésia.

Inyo craters (California)

Inyo Obsidian Domes






Final da aula