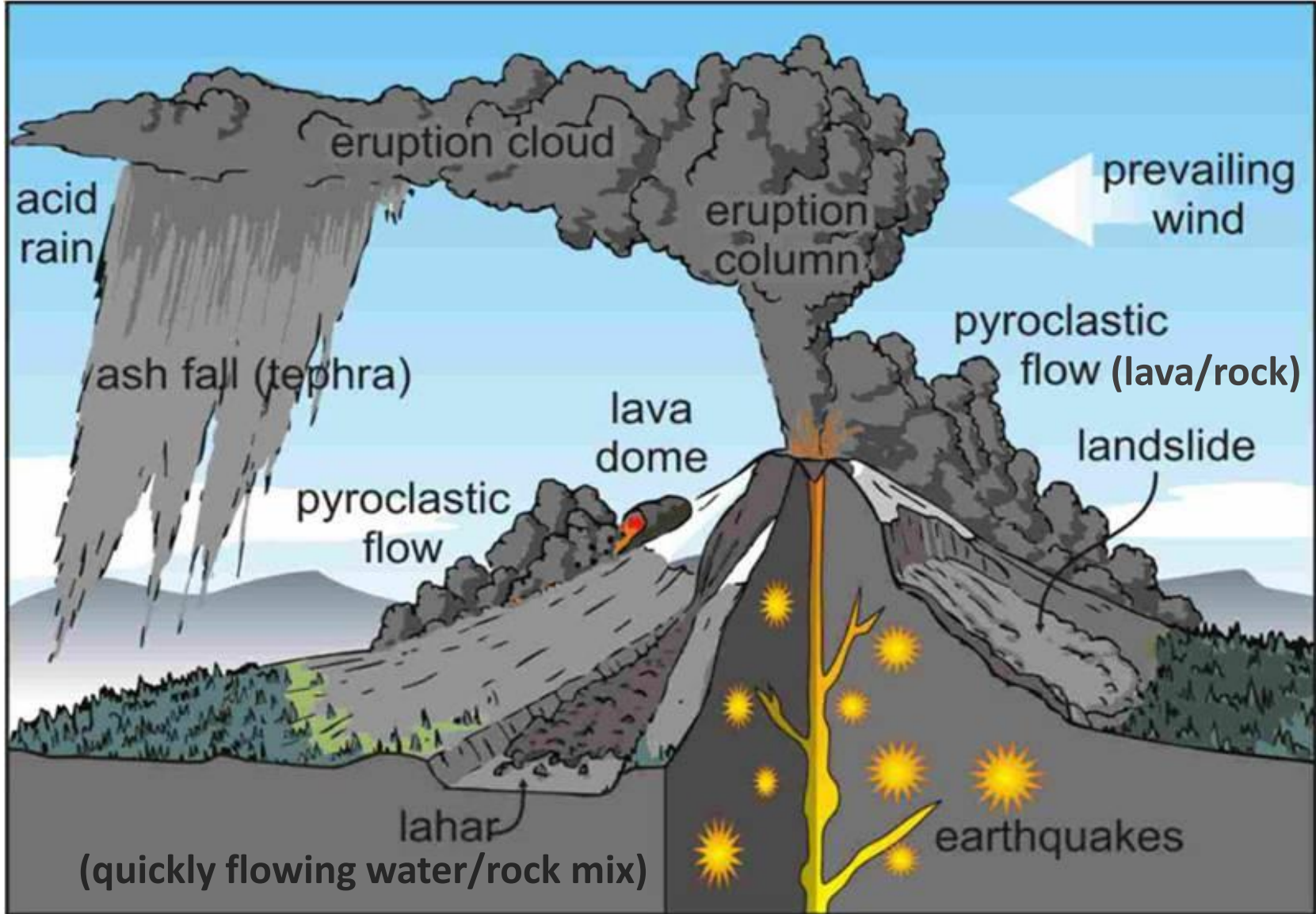


# Volcanic Eruption: Explosive

Very high viscosity magma prevents the release of volcanic gases; gases accumulate, and the magma pressure builds up... until it is blasted out in an explosion!



# Explosive Eruption Diagram





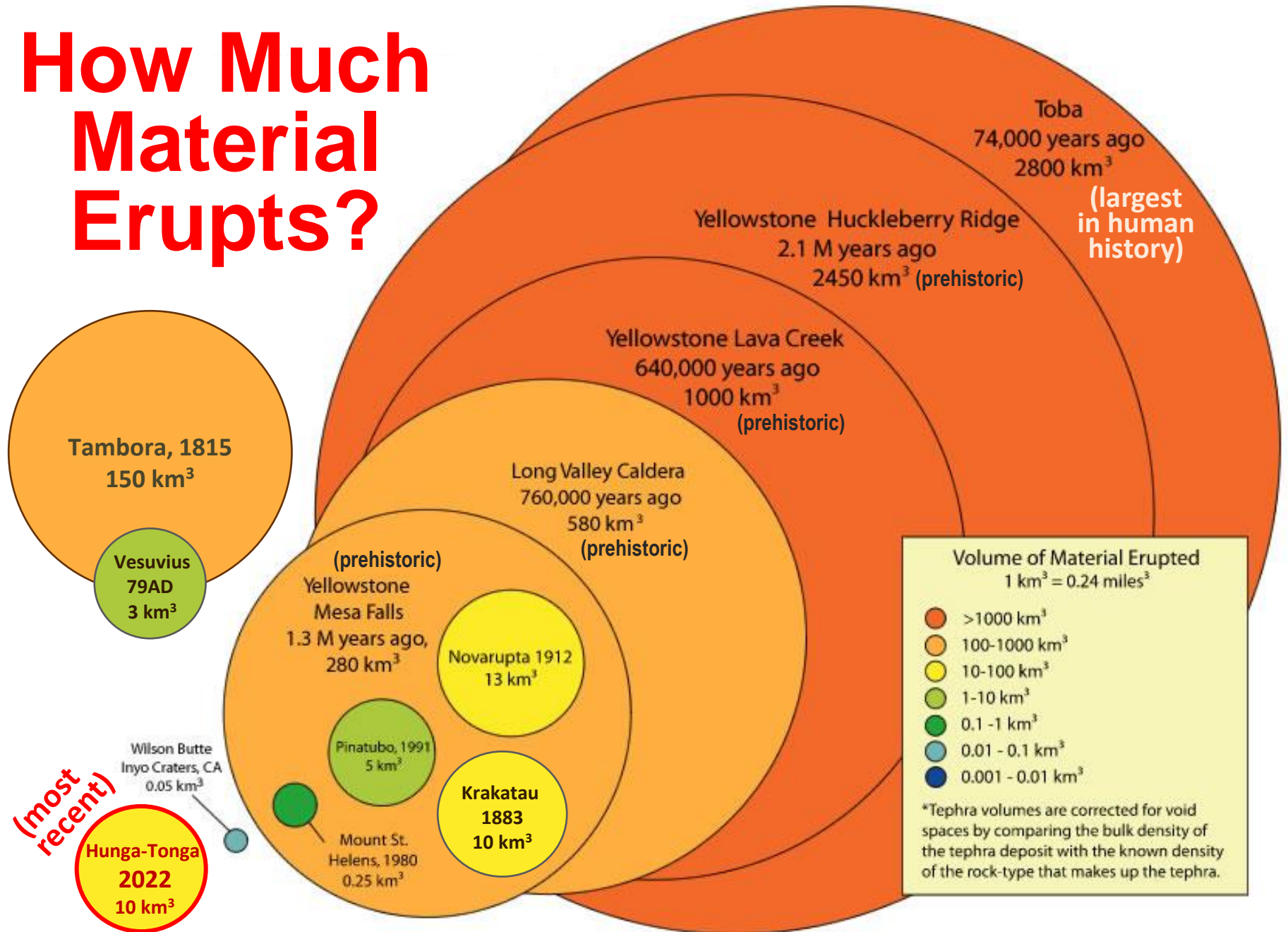
# Volcanic Eruption: Non-explosive

- Most volcanoes erupt basalt, a fluid **low viscosity lava** that erupts *effusively* (quietly) and forms *flows* with occasional *fountains*.



- **Higher viscosity lava** with low gas content produces bulging lava *domes*.

# How Much Material Erupts?

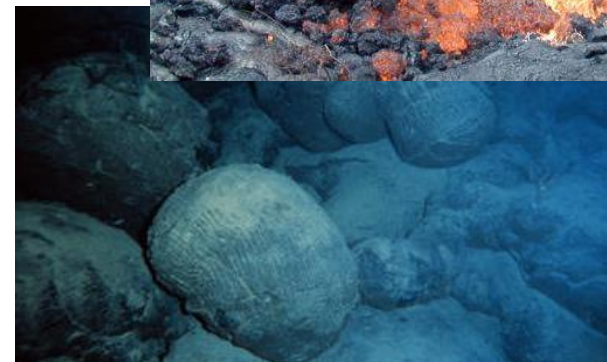




# Lava: magma that reached the surface!

**Lava** (“the liquid”) is mostly molten rock:

- Pahoehoe lava - basaltic lava, low viscosity (flows easily), allows gases to escape.
- Aa lava (pronounced “aa-aa”) - basaltic lava, higher viscosity; solidifies flowing, forms angular pieces.
- Pillow lava - lava extruded *underwater*; cools and contracts, forms spherical masses; found at the ocean floor.



**Viscosity** of lava is mostly determined by the *amount of silica* in it.

# Solid Ejecta

Ash and **pyroclastic material** (“the solid”) is airborne material ejected by a volcano:

- **Volcanic ash**  
< 0.06 mm to 2 mm;  
composed of rock, mineral,  
and volcanic glass
- **Cinders**  
2 mm to 64 mm;  
composition same as ash  
hazardous when falling!

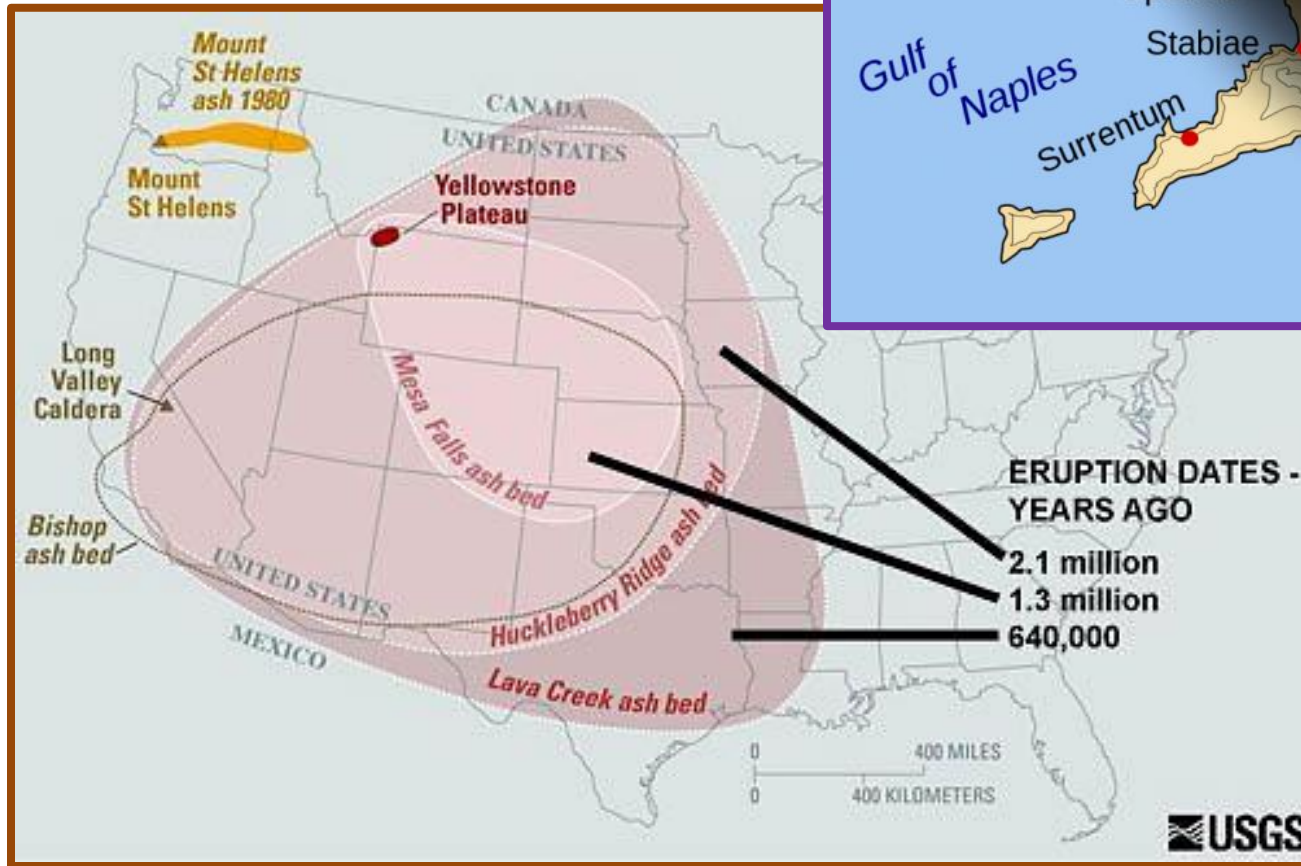


- **Bombs**  
> 64 mm, shapes vary;  
formed by molten rock  
solidifying in the air



# Volcanic Ash Fall Zone

Can cover hundreds of thousands square miles!



**Vesuvius** ash fall zone was roughly 100 times smaller than that of the latest (640,000 YA) **Yellowstone** eruption!



# Volcanic Gases



**Significance?**  
Determines violence  
of an eruption:

**High gas = violent  
eruptions!**

- **Volatiles** (substances that easily boil and evaporate)

H<sub>2</sub>S – Hydrogen sulfide

H<sub>2</sub>O – Water vapor

SO<sub>2</sub> – Sulfur dioxide

CO<sub>2</sub> – Carbon dioxide

N<sub>2</sub> – Nitrogen

HCl – Hydrochloric Acid

**Effect on global climate**

← block sunlight

← greenhouse gas



# Volcanoes and Climate

## Mt. Tambora, Indonesia •

Largest observed eruption  
in *recorded* history;  
1816 “Year Without Summer”



## • Mt. Pinatubo, Philippines

Second largest eruption of the 20<sup>th</sup> century, June 1991.

