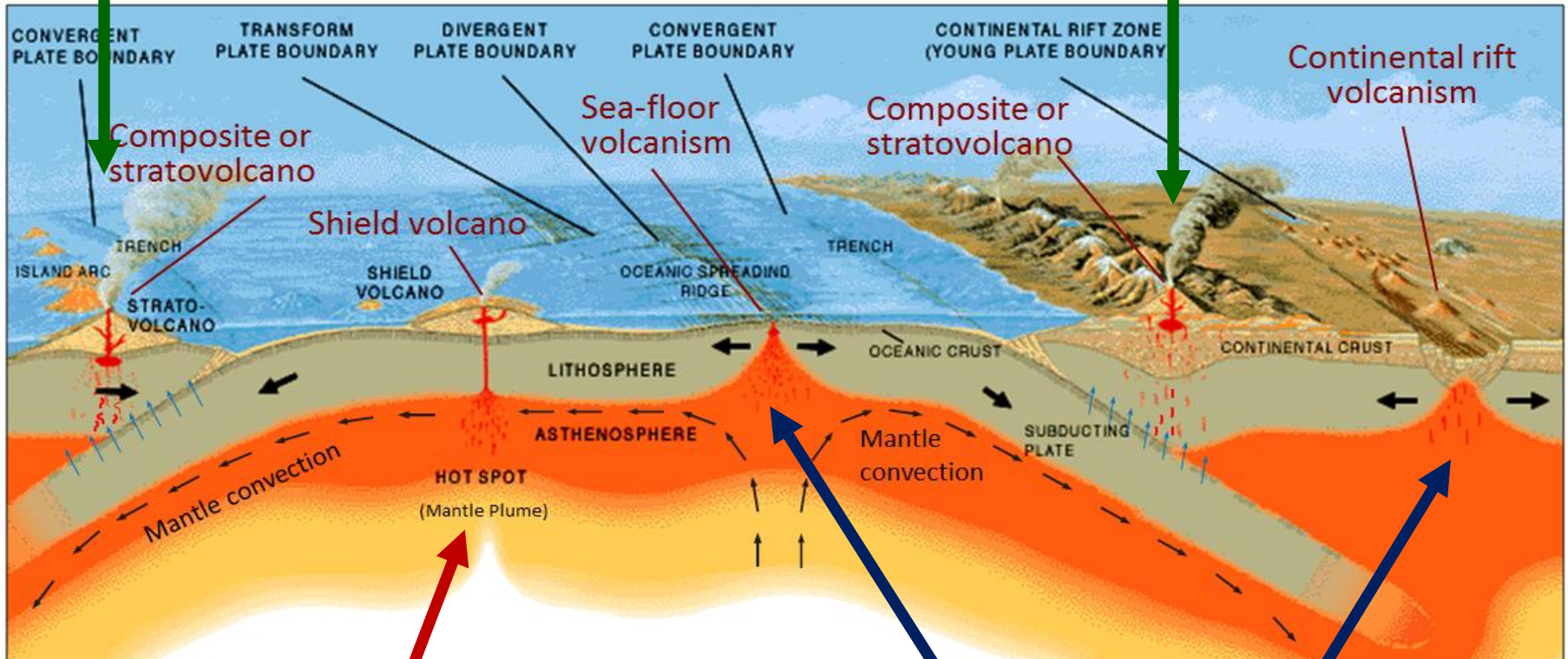


# Types of Volcanism

**Subduction zone volcanism  
(most common)**



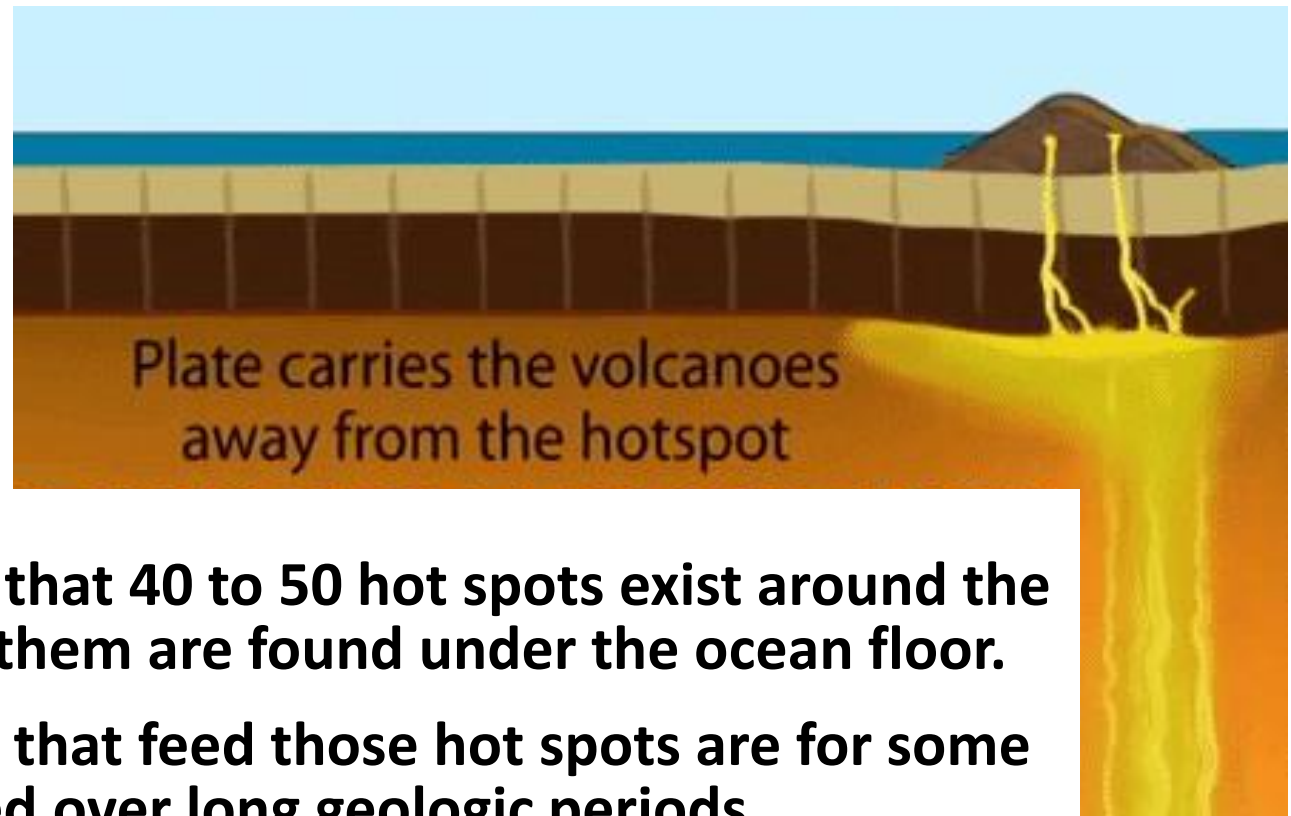
**Hot spot  
volcanism (rare)**

**Spreading  
ridge/rift volcanism**

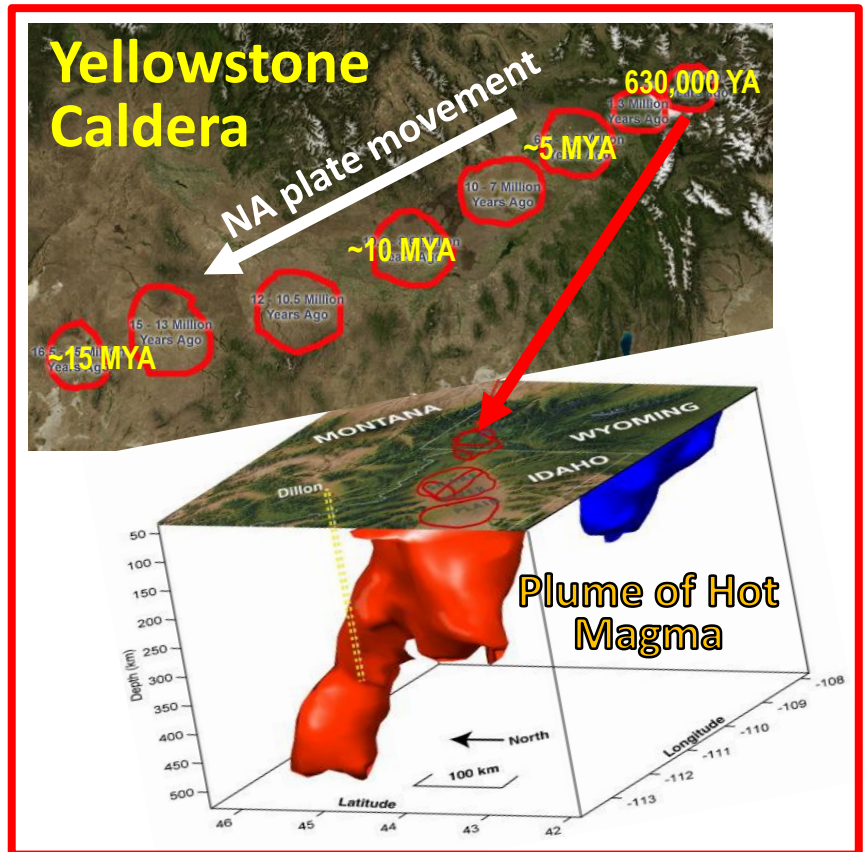
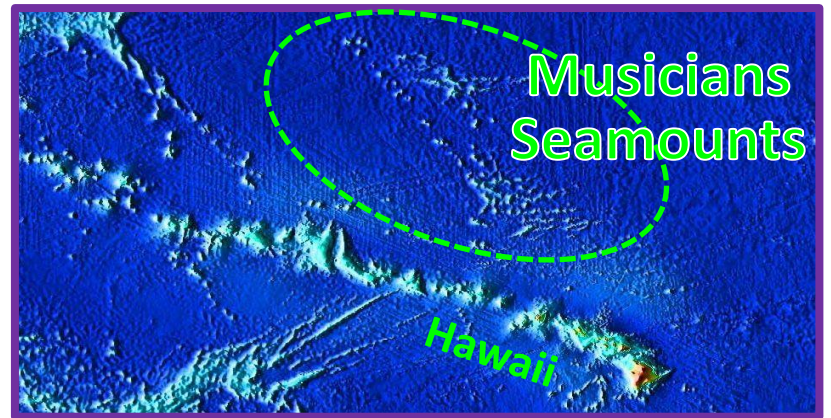
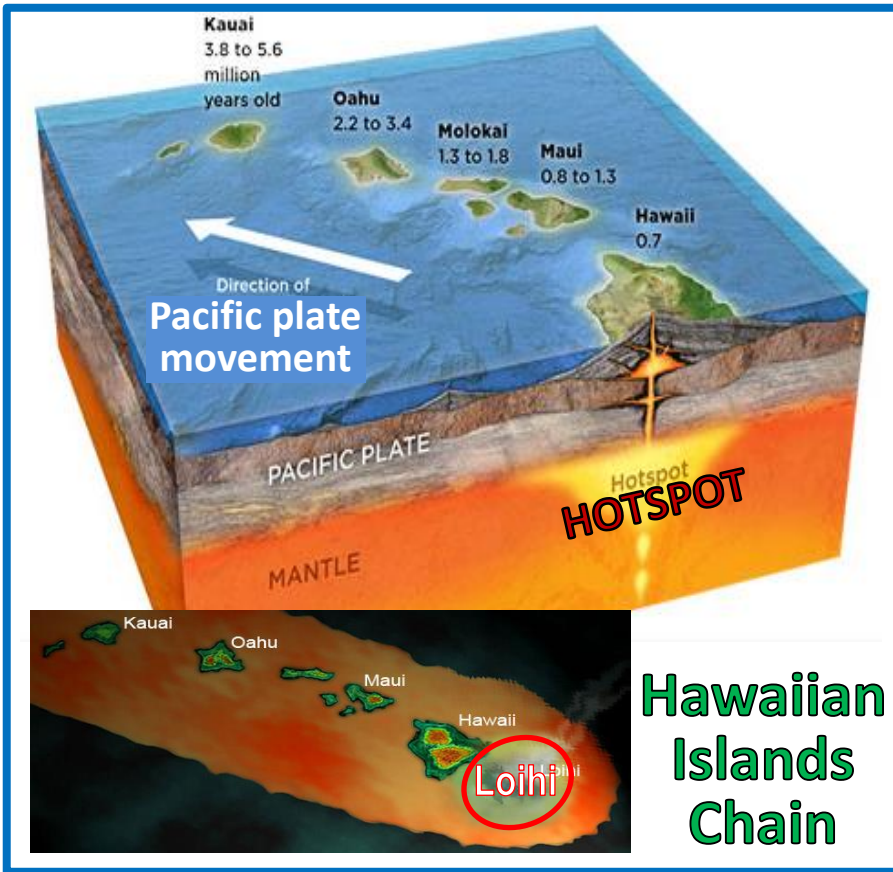
# Hot Spot Volcanism

Hot spots are due to a **plume of hot magma** flowing up to the crust from the core-mantle boundary.

- Over time, the **tectonic plates of the Earth move over** the hot spots leaving a **trail of volcanoes**.



- Scientists think that 40 to 50 hot spots exist around the world; most of them are found under the ocean floor.
- Magma plumes that feed those hot spots are for some reason sustained over long geologic periods.
- Volcanoes carried far away from the hot spot become **extinct**.



# Volcanic Landforms: Caldera

*(Spanish for “cooking pot”)*

Volcano rapidly empties its magma chamber, and support is lost. Overlying material collapses into the magma chamber: a caldera forms.

- **Explosive calderas**

Silica-rich magma feeding these volcanoes has high viscosity; gases tend to become trapped at high pressure within the magma, resulting in explosion.

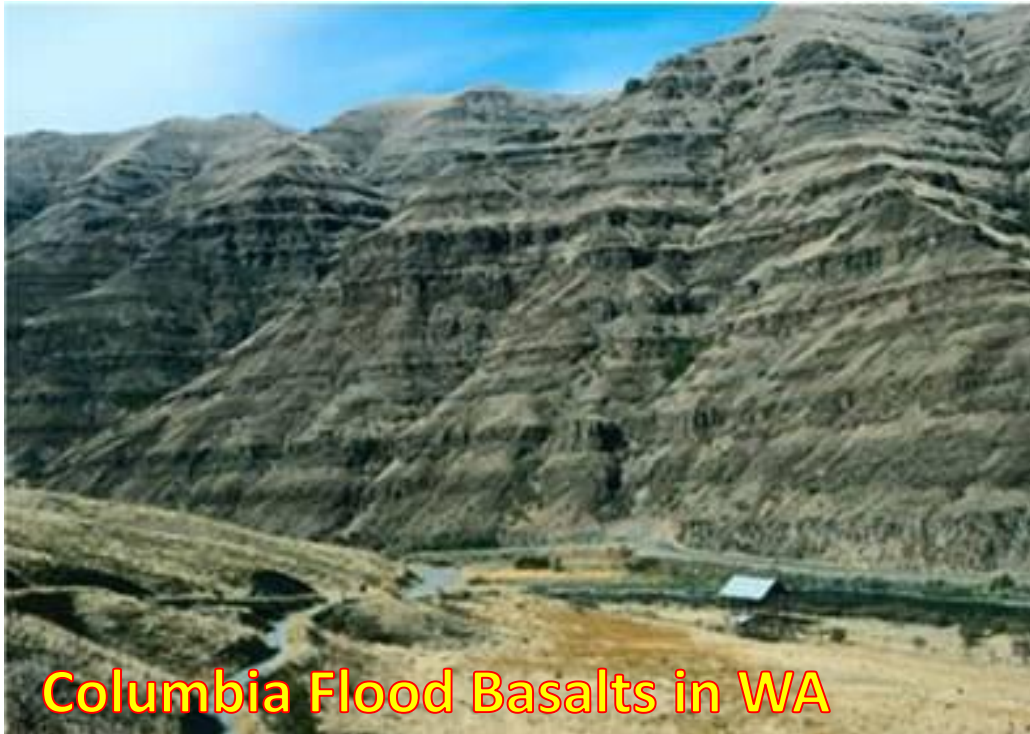


- **Non-explosive calderas**

Basaltic magma feeding these volcanoes is silica poor and much less viscous; the magma chamber is drained by large lava flows rather than by explosive events.



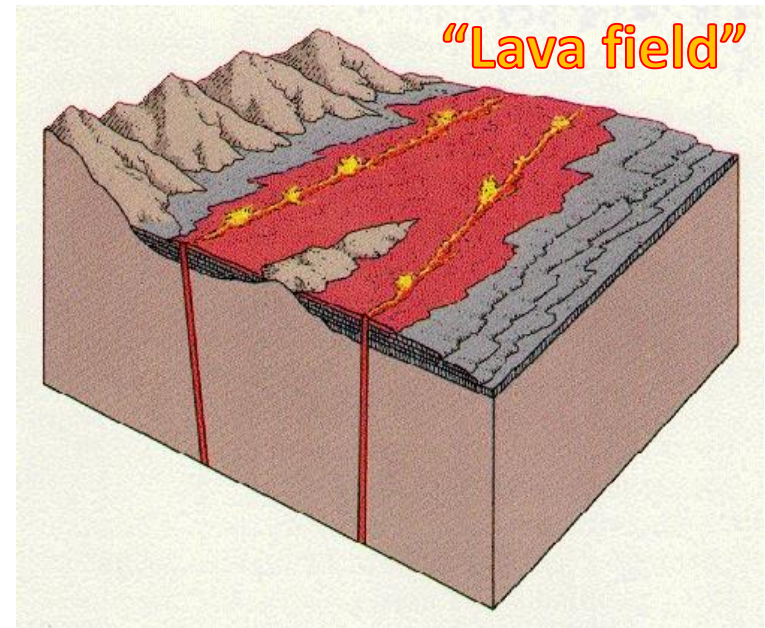
# Volcanic Landforms: Flood Basalts



Columbia Flood Basalts in WA

- Multiple, “quiet” eruptions
- Lava *plateau* forms
- Flood basalt volcanism has been connected to major mass extinction events in the past.

- Large (10-100 square miles) outpourings of very low viscosity basaltic lava



# Volcanoes and Climate

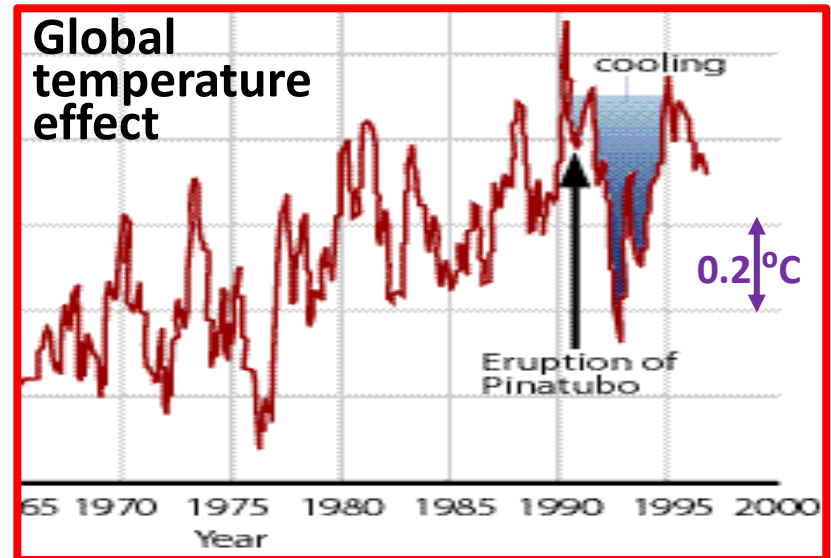
## Mt. Tambora, Indonesia •

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.

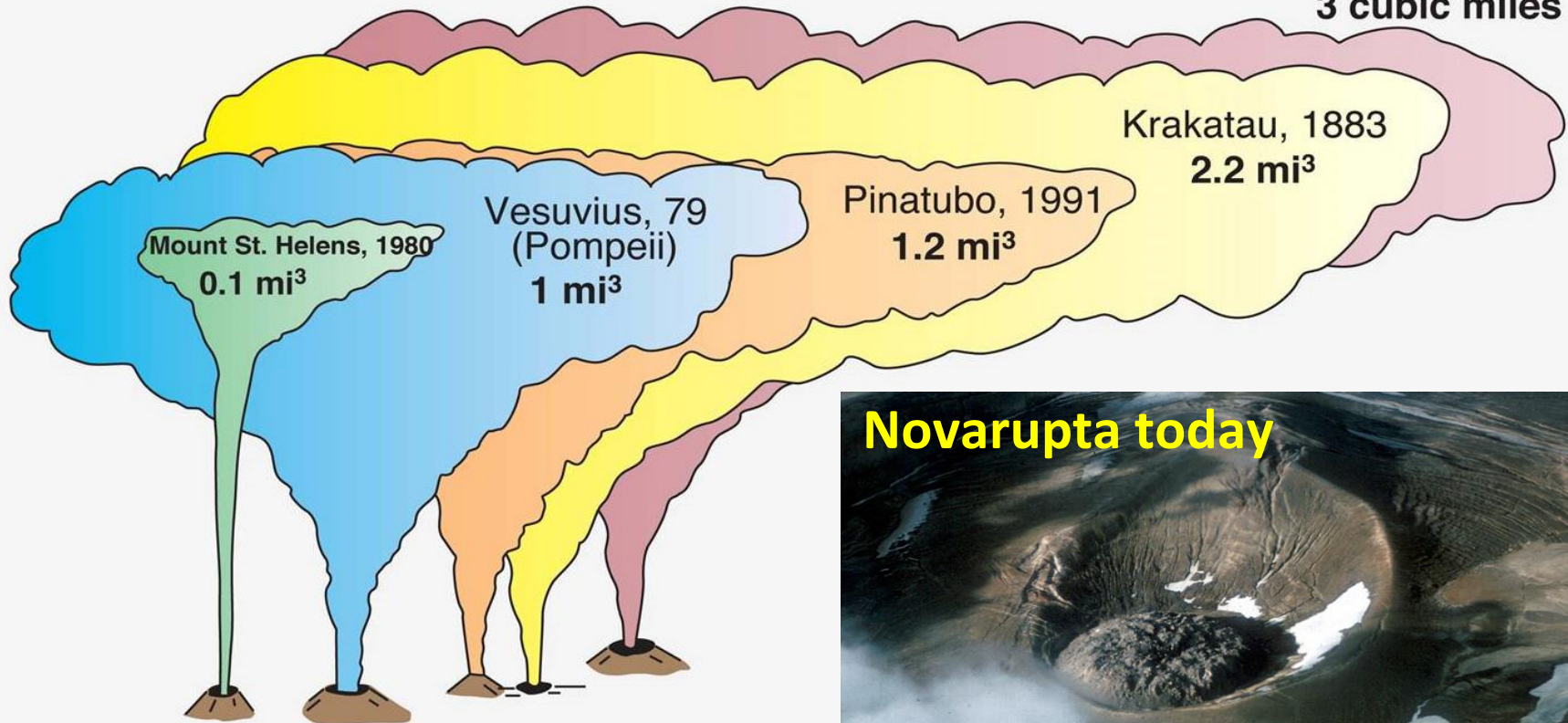


# The Most Powerful Volcanic Eruption of the 20<sup>th</sup> Century



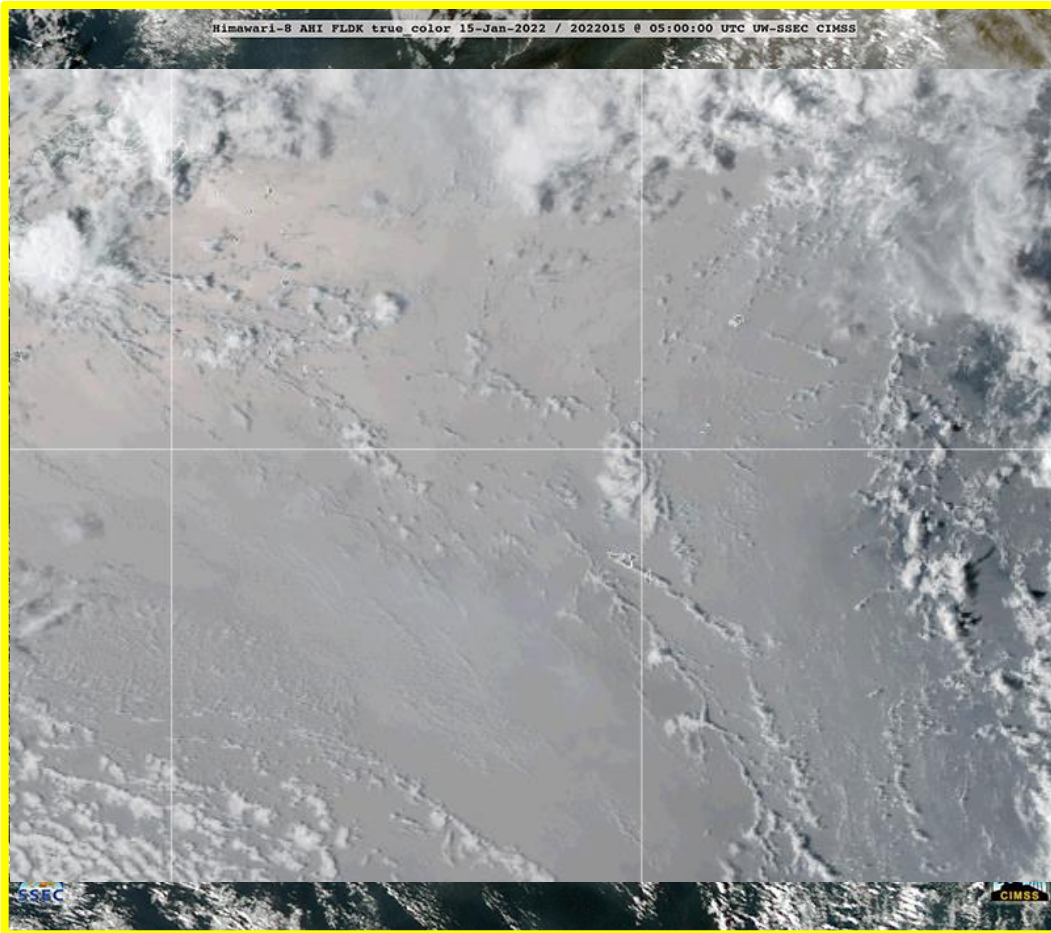
Went almost unnoticed - people in Juneau, Alaska, about 750 miles from the volcano, heard the sound of the blast – *over one hour after it occurred.*

• **NOVARUPTA**  
**Alaska 1912**  
3 cubic miles



# The Most Powerful Volcanic Eruption of the 21<sup>st</sup> Century

Hunga Tonga-Hunga Ha'apai, 14-15 January 2022



- Blast as powerful as Krakatoa - biggest *boom* ever recorded!
- Ejected  $\sim 2 \text{ mi}^3$  of material; generated an ash plume half the size of France.



# Dangerous volcanoes are constantly being monitored by volcanologists using the following methods:

- **Measuring slope**
  - bulges may form with magma pushing up.
- **Measuring volcanic gases**
  - outflow of volcanic gases (*sulfur dioxide, carbon dioxide*) may precede eruption.
- **Measuring temperature from orbit**
  - monitoring changes in temperature over time.
- **Measuring small quakes**
  - increase in number & intensity before eruption.