

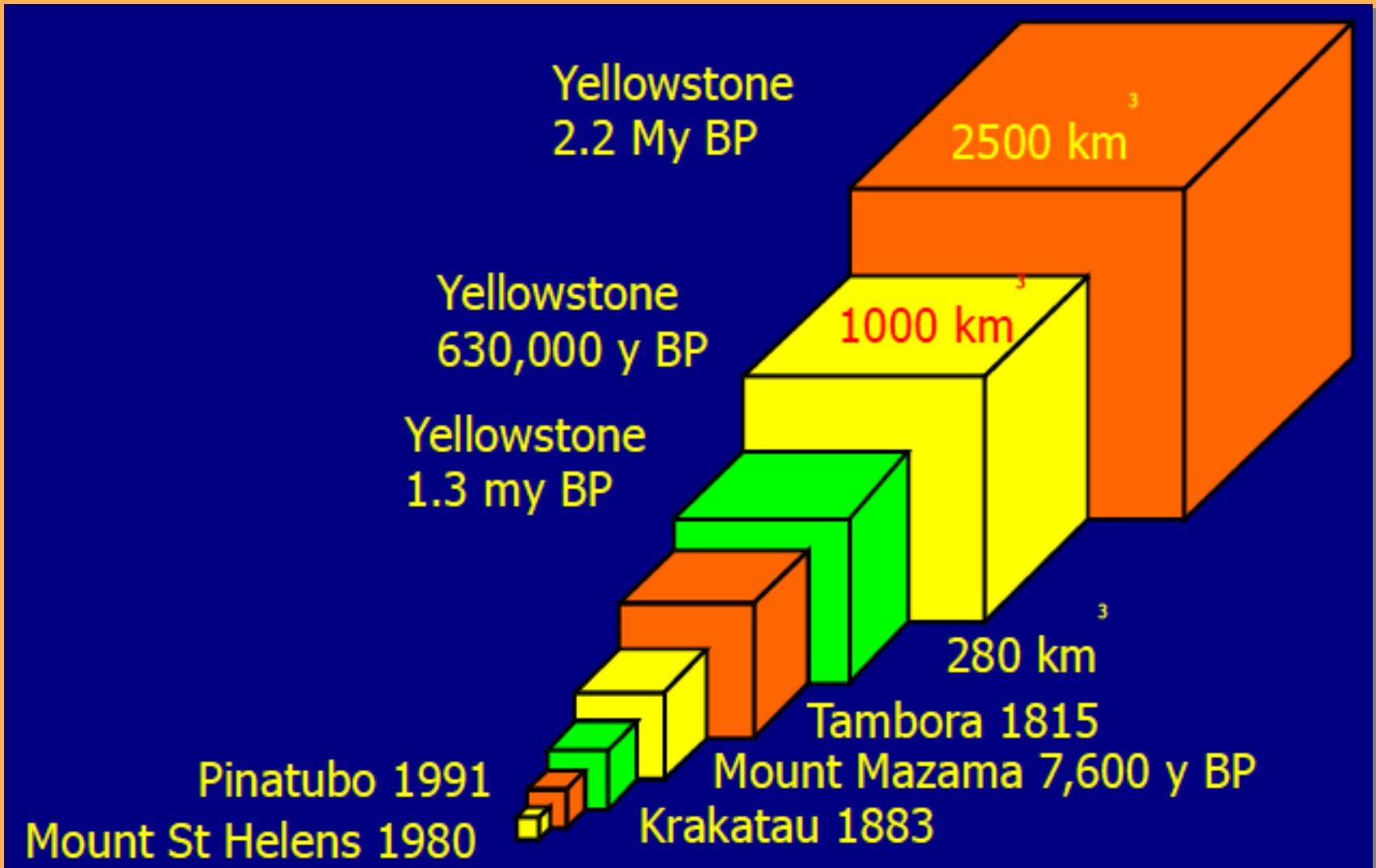
## The Lesson of Eyjafjallajökull 2010

# Impact of Explosive Volcanic Eruptions:



- Impact of volcanic aerosols on climate -  
Tambora 1815 and Year without summer 1816
- Effects of volcanic ash on aviation

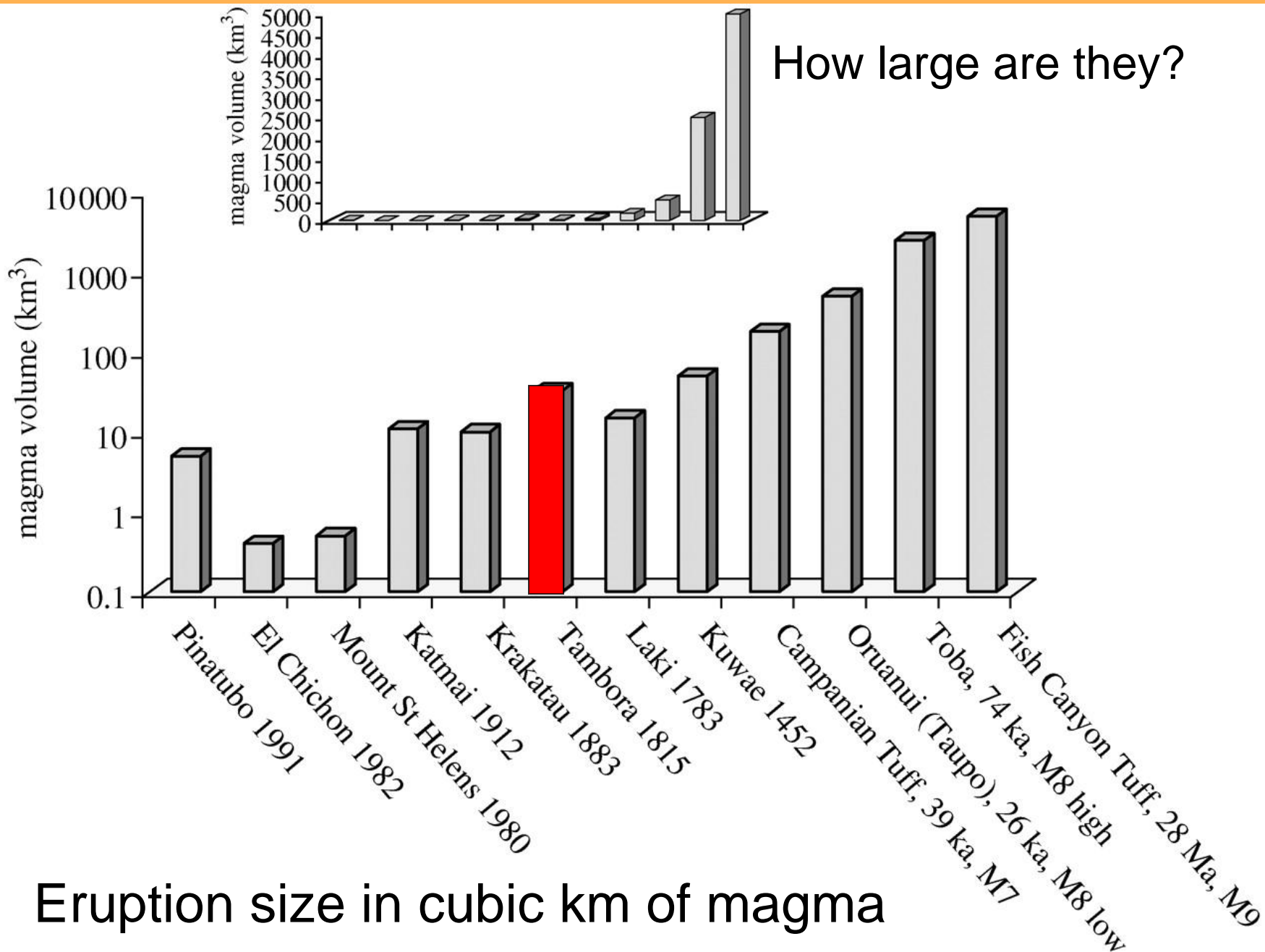
# Eruption size as volume of erupted magma



Size ranges over five orders of magnitude.

Eyjafjallajökull at the small eruption end (ca. 0.2 km<sup>3</sup>)

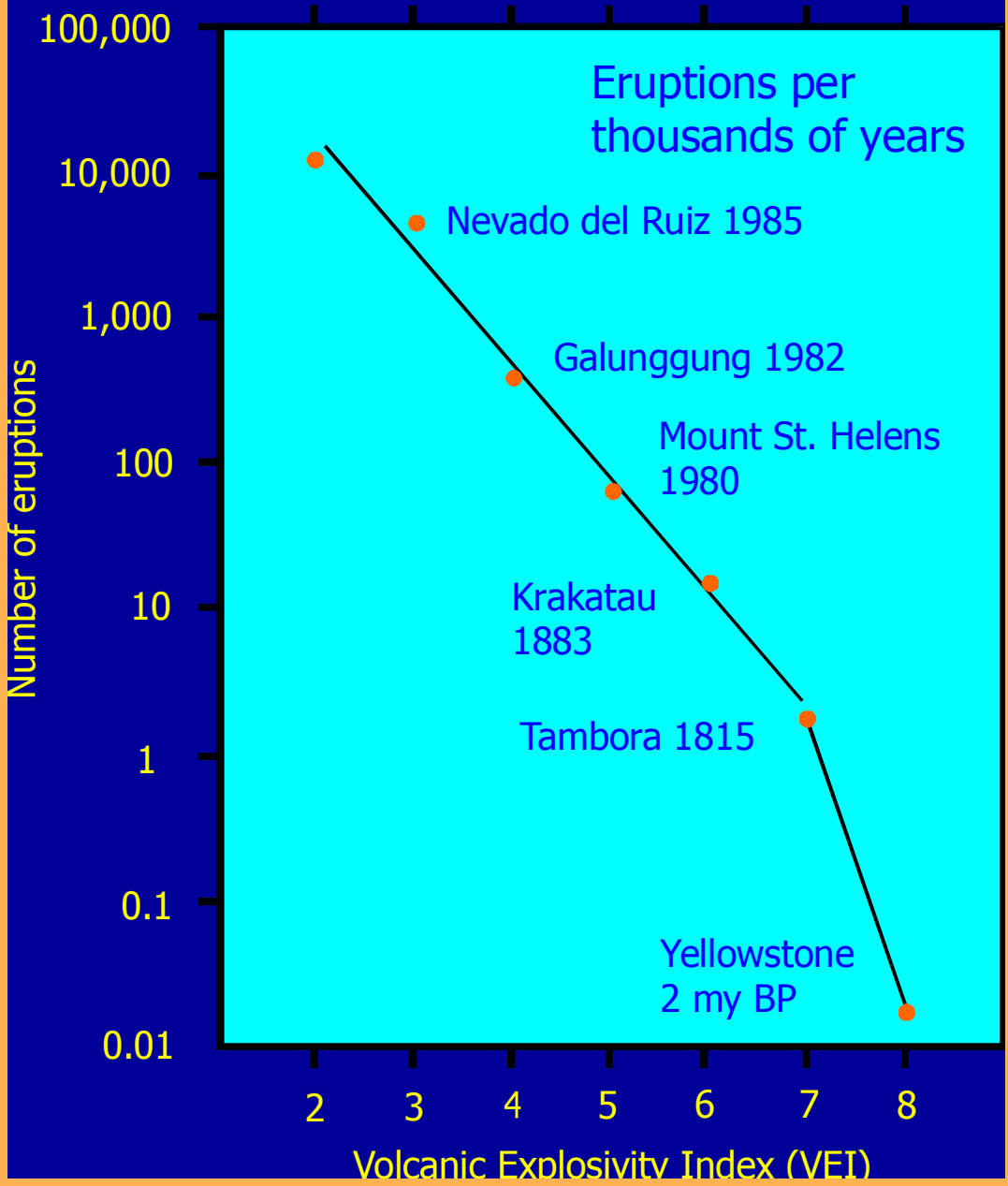
How large are they?



Eruption size in cubic km of magma

Tephra volume (m<sup>3</sup>)

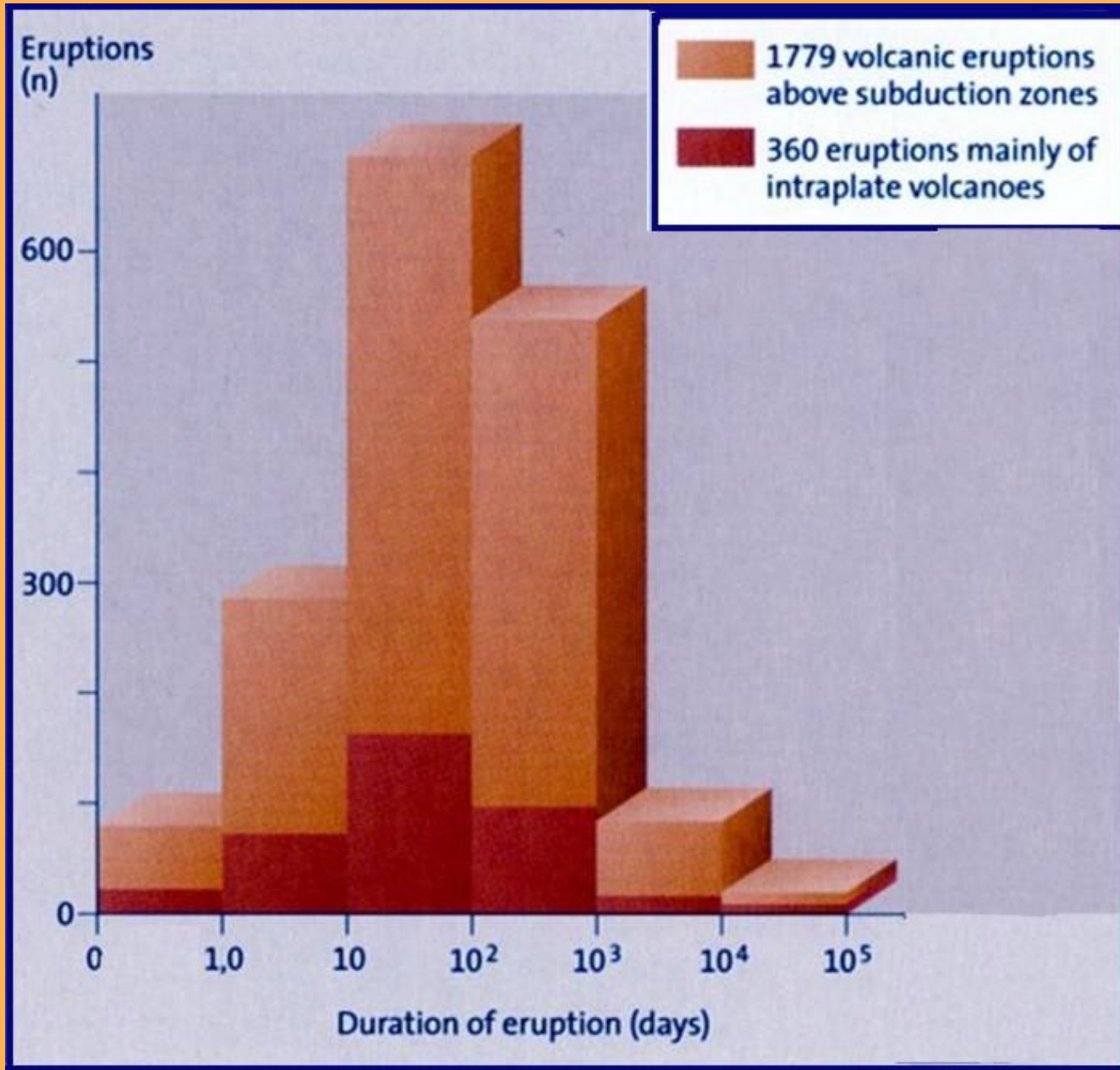
10<sup>6</sup>      10<sup>8</sup>      10<sup>10</sup>      10<sup>12</sup>



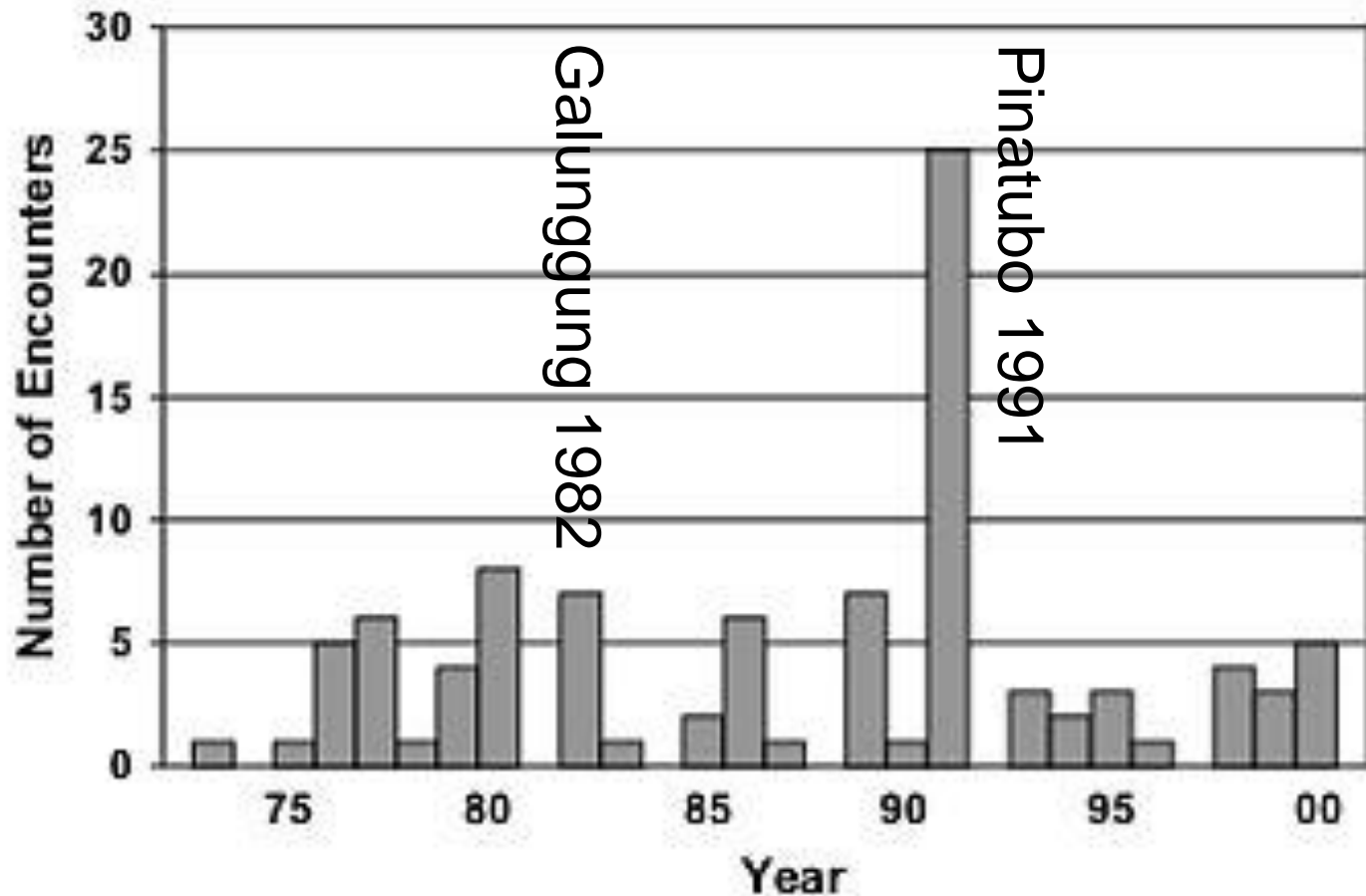
How frequent are they?

Recurrence interval of a given eruption size per thousand years

# How long are they?



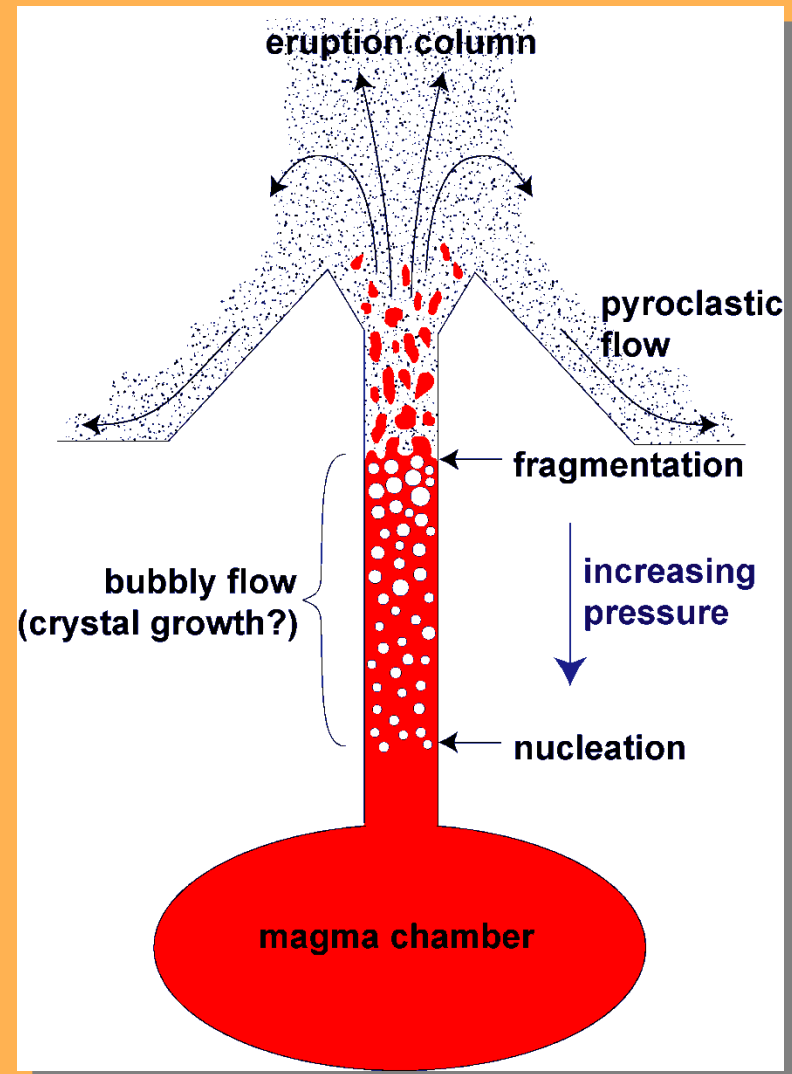
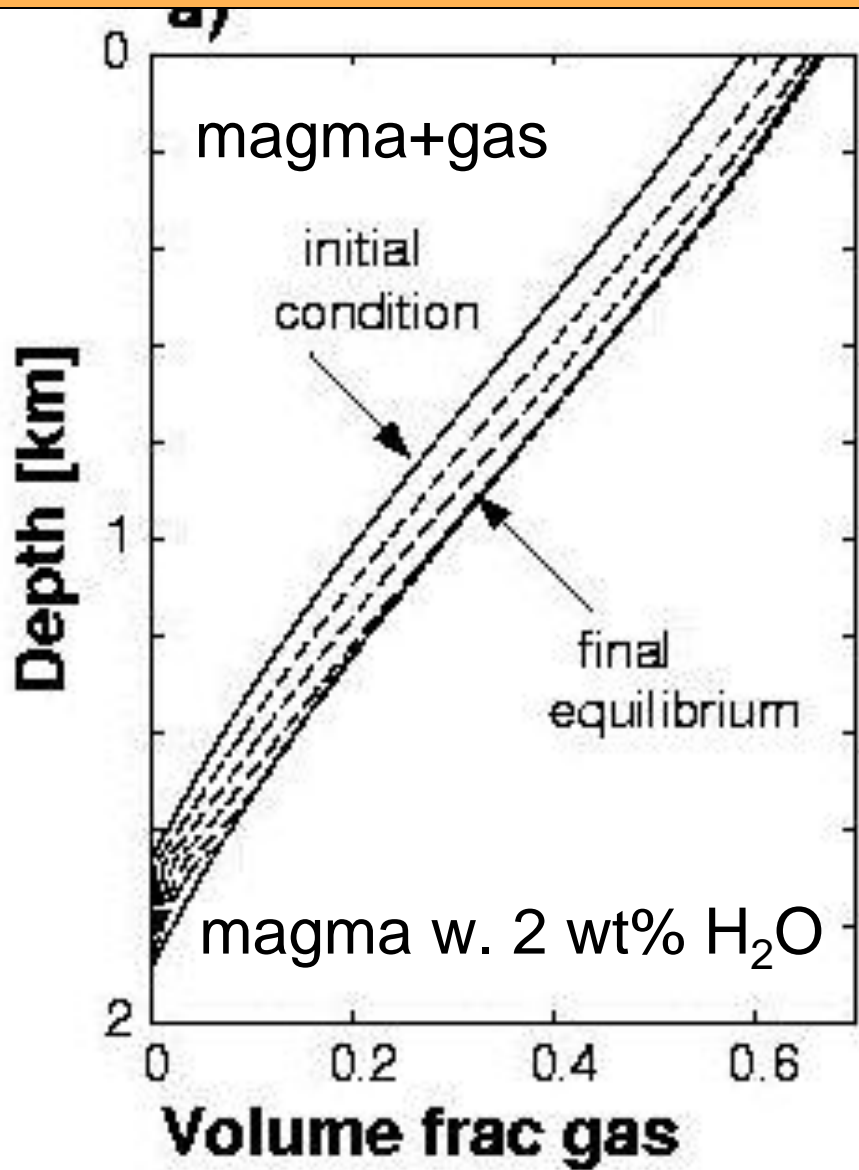
How many volcanic ash clouds to cruising altitude (10 km, 33000 ft)?



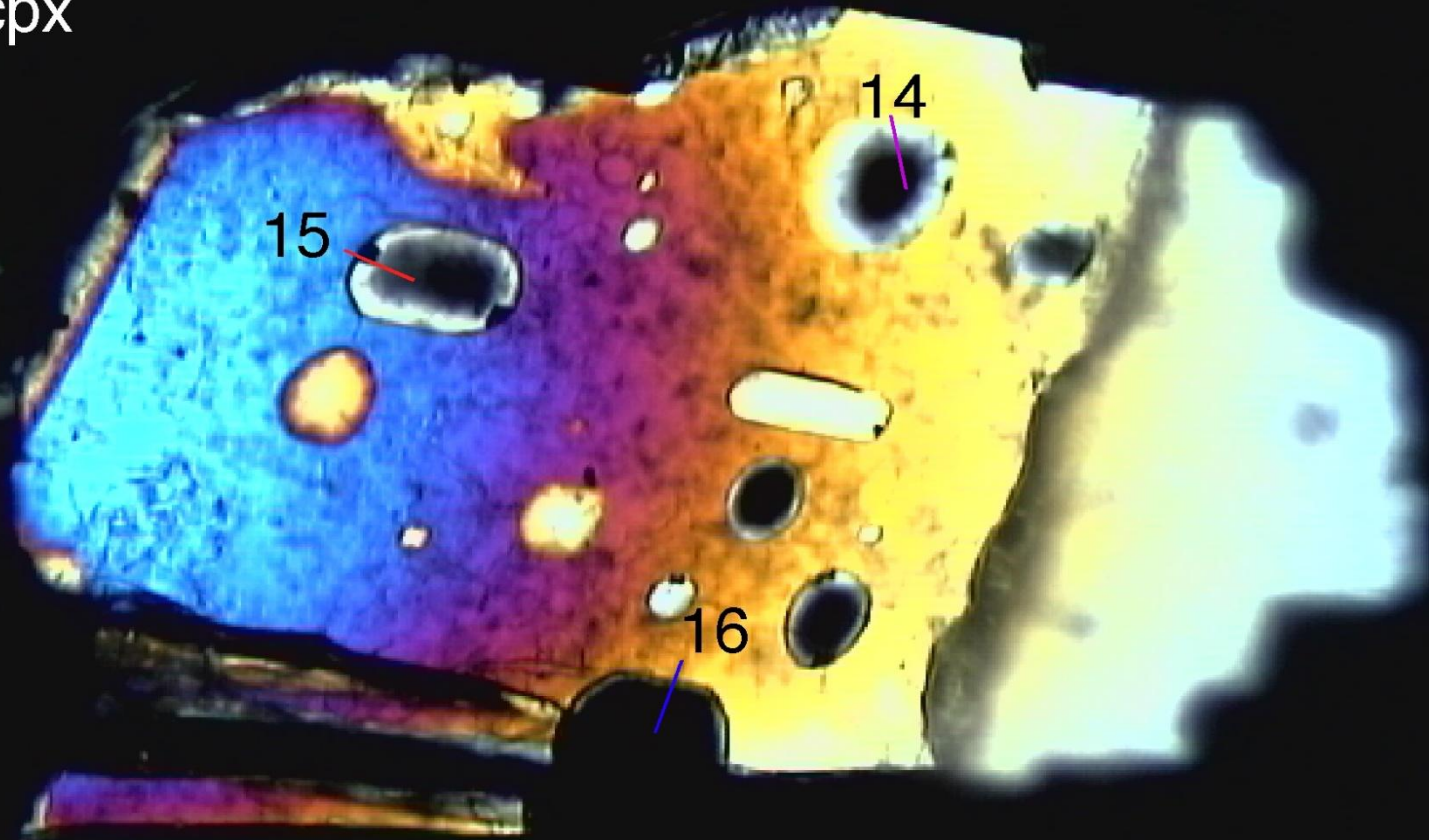
## How is magma fragmented to ash?

- Fragmentation of magma by expansion of magmatic gas phase
- Fragmentation due to interaction of magma with surface water (glacier, ocean etc.)

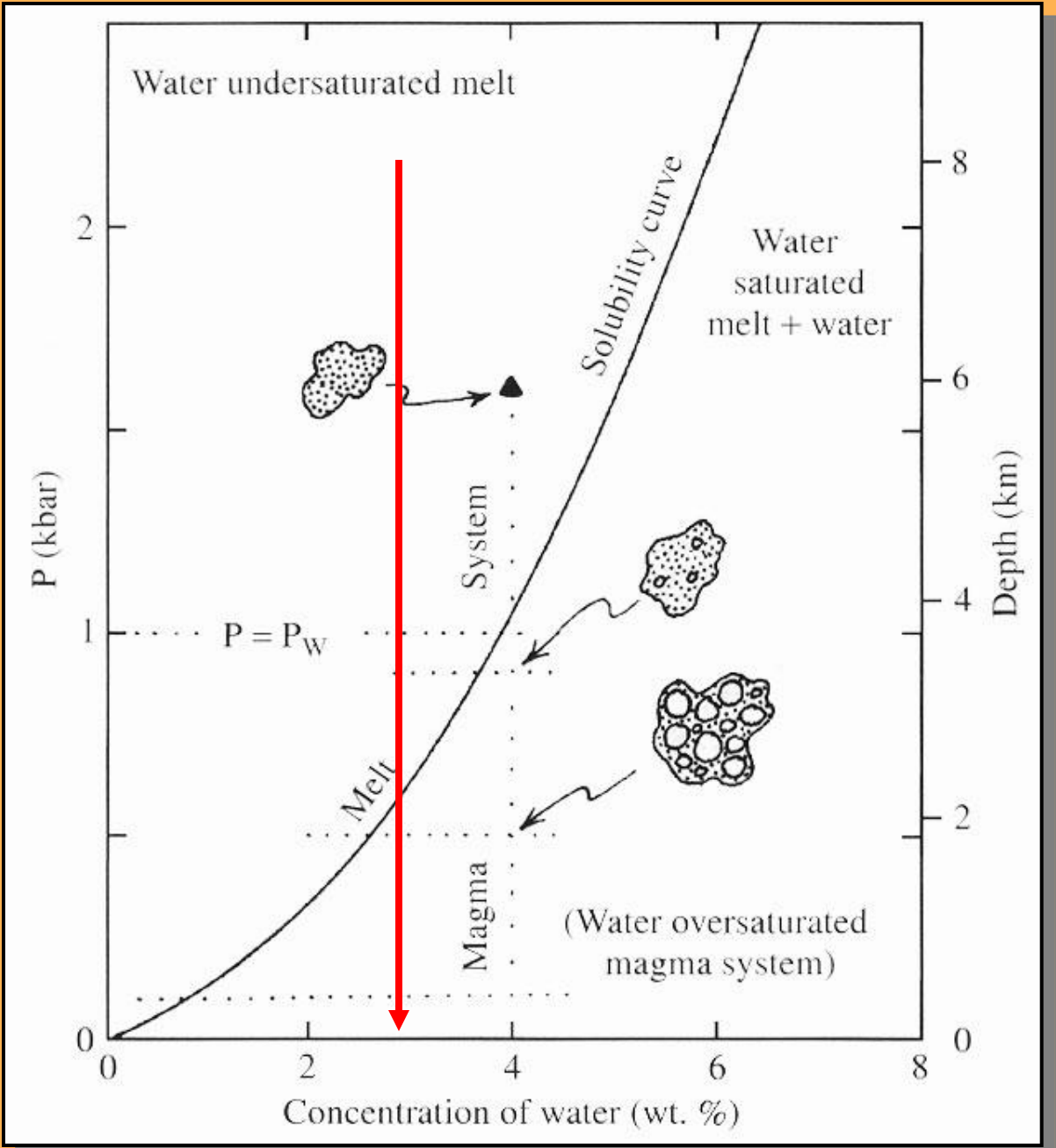




Eyja-007-3#14, 15, 16  
in cpx

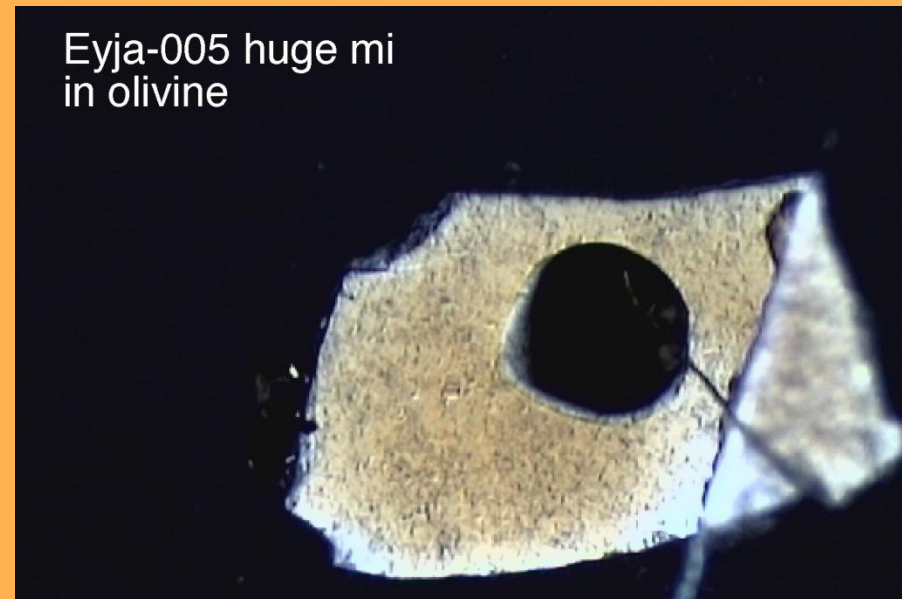
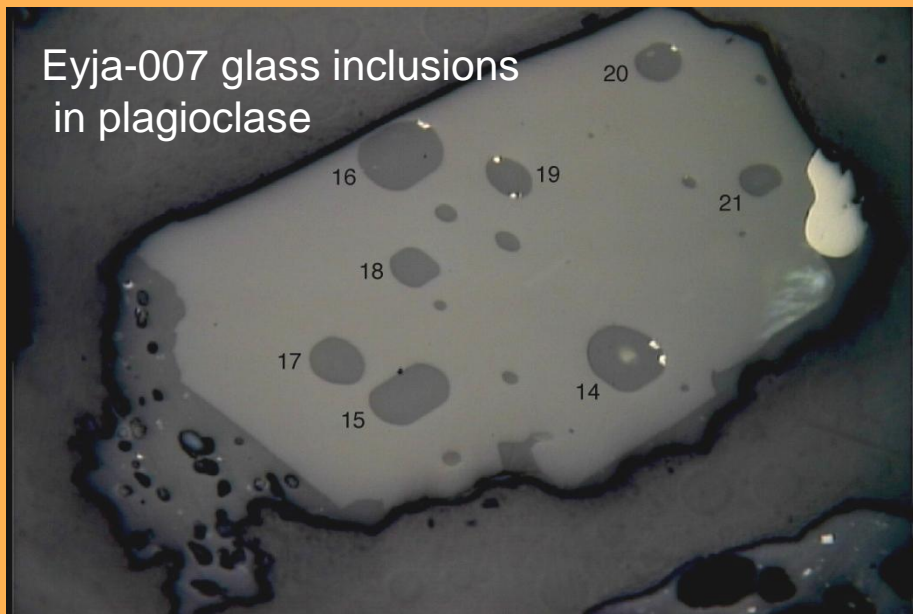


Glass inclusions in crystals give volatile content of magma



# Gas content of Eyjafjallajökull magmas:

	Total volatiles	H <sub>2</sub> O	CO <sub>2</sub>	SO <sub>2</sub> wt.%
Basalt magma	1.36	1.30	0.16	0.32
Trachyandesite	3.26	1.88	not detected	0.51



The second fragmentation process:  
Ash formation due to magma and water  
interaction within the Eyjafjallajökull  
glacier

