Volcanoes and the Climate

David Henry

Danny Witte

Tues 11:00-12:30

Why study volcanoes and its effects.

- Interesting and effects us (humans)
- Learn how and why it effects the climate
- Also, know the range of their effects.
- To see if they caused any past events.

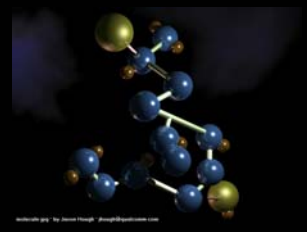
What we wanted to learn.

- What is effect of volcanic eruptions on climate

- What is the reach of the effects of Volcanoes

Gases emitted

- Water vapor
- Carbon dioxide
- Sulfur dioxide



- These gases rise 10's of kilometers into the atmosphere

When Volcanos Erupt

Winds blow gases hundreds to thousands miles away from the volcano. Spreading The Gases.

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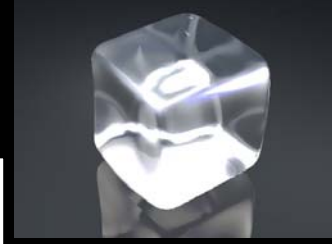
Effects on climate



- Sulfur Dioxide emitted into the Stratosphere can result in up to 0.5-0.6° C cooling.

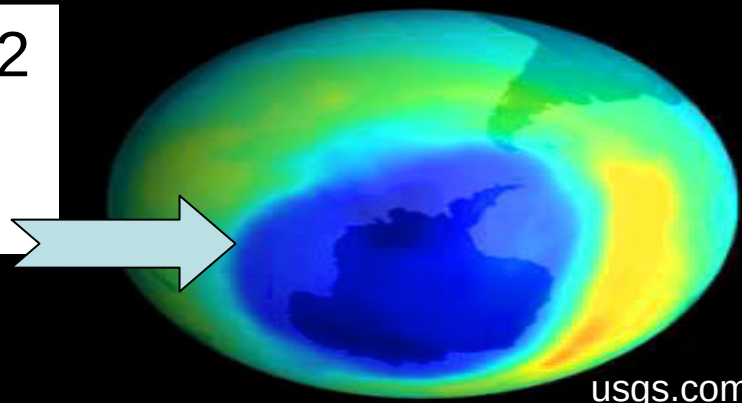
-Sulfer Dioxide cools because it blocks solar radiation.

- Acid Rain may result from Volcanic eruptions.

The Sulfur dioxide => reacts with Human CFC's=> Faster Ozone depletion.

Diagram from: geology.sdsu.edu

- After Sulfur Dioxide is gone the CO_2 and **holes in the ozone** cause warming the following years.



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Reach of Volcanic Explosions

- Widespread
  - Examples:
    - Pinatubo- most recent Volcano to effect the climate
      - The ash cloud from the volcano covered an area of some 125,000 km (50,000 mi²), bringing total darkness to much of central Luzon.
      - Girdled the equator
        -Volume of ejected materials= 1 mile
      - It ejected roughly 10 billion metric tons of magma, and 20 million tons of SO 2 (Ruddiman)
      - Northern Hemisphere saw a decrease in average temperatures of 0.5–0.6 ° C (0.9–1.1 ° F), and a global drop of about 0.4 ° C (0.7 ° F). (Wikipedia)

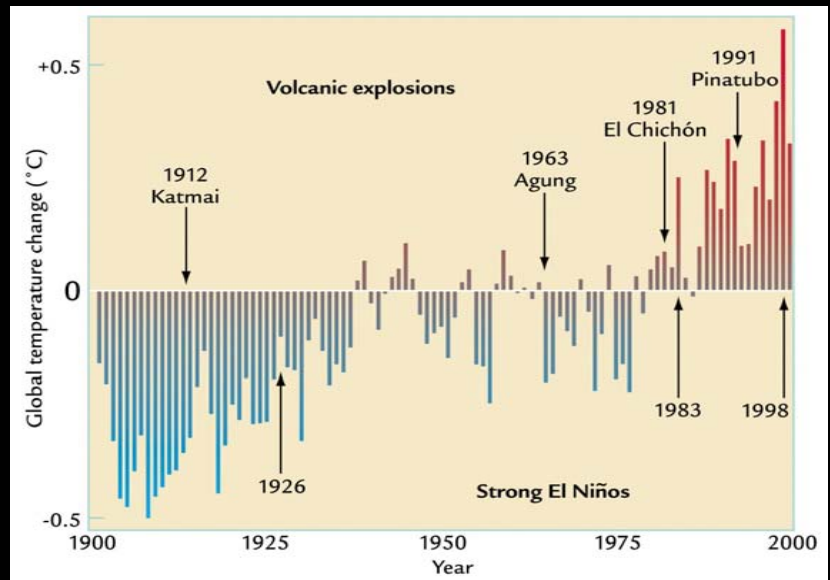


Diagram from Ruddiman

Ruddiman and Wikepedia 4/07

Year Without a Summer

» Mt. Tambora in Dutch East Indies

- Effected northeast America, Canada and northern Europe
- Killed crops, June snowstorms in New England and Canada (Wikipedia)
- Temperatures switched from 95 degrees to freezing in just hours

Wikepedia 4/07

Volcanoes role in extinction of dinosaurs

- *Overview of Time Period*

- Deccan traps were hotbed of volcanic activity during cretaceous (The Age of the Dinosaur)
- Then, Indian subcontinent was detached and moving towards Asia, So the movement of the Indian continental plate led to several eruptions
- Sequence of flows is over 8,000 feet thick, more than 25% the height of Mount Everest. Individual flows were between 33 and 164 feet thick.
- More near south Atlantic ocean and Antarctica.
- Tremendous quantities of dust and sulfate aerosols into atmosphere

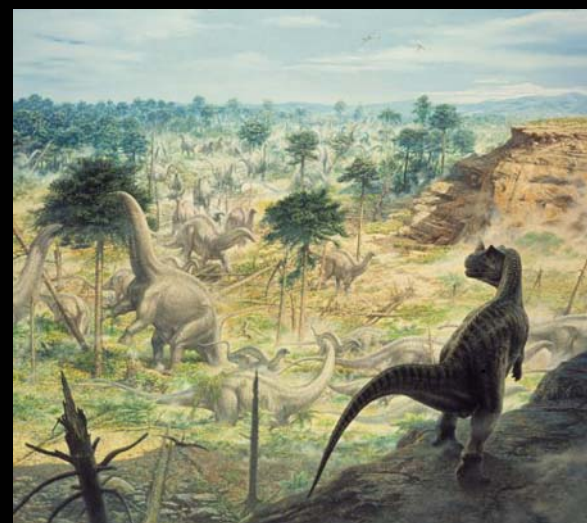
Theory from *Mistaken Extinction* by Dr. Timothy Rowe pg 34-42

Effects of this Volcanism

An interesting theory on Volcanoes and Dinosaurs

- Short term- Acid rain, Sulfur Dioxide, emissions of dust, acidic water, depletion of ozone layer, darkness. Kill microorganisms=disrupt food chain
- This recurred a lot
- Long term effects- CO 2 levels rose eight times to that of today- increasing global temperatures as much as 9 degrees
- Critics of this: How did this not extinguish turtles, snakes, lizards, crocodiles, etc???- Well, why didn't the meteorite kill them as well?

Theory from *Mistaken Extinction* by Dr. Timothy Rowe pg 34-42



Volcano Hazards Program

- Volcanologist study volcanoes and monitor volcanoes at 5 Observatories in the US.
- Alaska
- Cascades
- Yellowstone
- Hawaii
- Long Valley, California.

Source: U.S. Geological Survey's Volcano Hazards Program

Sum It Up

- Sulfur dioxide from volcanic eruptions cause .5-.6 degree Celsius cooling.
- The CO2, water vapor, and depletion of the ozone from Sulfur dioxide raise temperatures higher than they were before the eruption in the year following.
- The reach of volcanoes is not only regional, but it disrupts the global temperature.
- Volcanoes ARE believed to be ONE of the causes of dinosaur extinction.
- Volcanoes can’t be stopped, but The Volcano Hazards program is helping to better understand them.

Work Cited

- Committee On The Review O. U.S. Geological Survey's Volcano Hazards Program. Washington D.C.: National Academy P, 2000. 93-102.
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