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.
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.

- After Sulfur Dioxide is gone the CO2 and **holes in the ozone** cause warming the following years.
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 km² (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 SO₂ (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 Wikipedia 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
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

- "Year Without a Summer." Wikipedia. 18 Apr. 2007 <http://en.wikipedia.org/wiki/Year_Without_a_Summer>.
- “Ozone Hole.” Department of geological Sciences at San Diego State University. 18 Apr. 2007 <http://www.geology.sdsu.edu/how_volcanoes_work/Thumblinks/ozonepage2.html>