The Effect of Volcanic Eruption on Climate and Global Warming

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ABSTRACT

It is generally believed that large volcanic eruptions have a strong correlation with global warming. In this study, we tested the hypothesis that the ash from large volcanic eruptions has a direct cause on climate change. In particular, by studying the eruption of Huaynaputina, (a famous volcano in Peru that erupted in 1600 AD) we could have an accurate prediction of how a large volcanic eruption would affect the world today and in the future.

BACKGROUND

- **Volcanoes**
  - 1,500 active volcanoes
  - Emit water vapors, carbon dioxide, and sulfur oxide
    - Water vapors and sulfur dioxide form sulfurous acid
  - Eruptions are caused by magma and gas beneath Earth's surface
  - Increase in pressure causes movement or crack in tectonic plates
  - Volcanic eruptions are measured by Volcano Explosivity Index (VEI)
- **Climate Measurement Tools**
  - Thermometers used to measure Earth's surface temperature after 1714
  - To learn the Earth's temperature prior to the invention of the thermometer scientists use proxy data such as tree rings and ice cores

HUAYNAPUTINA[3]

- Last major eruption March 6, 1600 [1]
- Ash fall reportedly until March 15, 1600. Fine ash until at least April 2, 1600. [1]
- Dust remained in air until March 26,1601, a year after the eruption [1]
- 16-32 million metric tons of sulfur spurred into the air. Deposits found in Greenland and Antarctica
- Northern Hemisphere had coldest winter in their last 600 years
- China had records of dimmed sun, lunar eclipse, and visible sunspots (typical affects of volcanic eruptions)
  - Also reported snowfall in summer of 1601

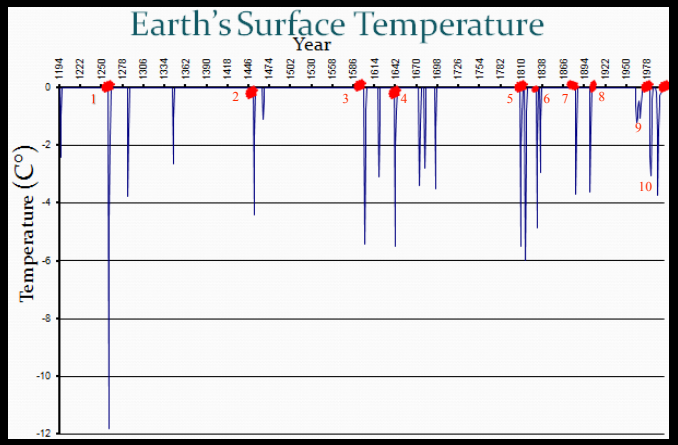
PURPOSE AND HYPOTHESIS

- Determine the correlation between the Huaynaputina eruption occurrences and Earth's temperature changes
- Determine the eruption occurrences affect the Earth's temperature and reduce global warming
- Learn how society would be affected if a large volcanic eruption were to happen today
- Hypothesis: Every decrease in the Earth's temperature can be linked to a large volcanic reaction with a VEI of 5 or higher

A large enough volcanic eruptions today could cause an ice age , Volcano Redoubt in Alaska may be close to erupting

RESULTS

Volcanic eruptions listed in chronological order: 1) Volcano in Iceland, 2) Kuwae, 3) Huaynaputina, 4) Parker, 5) Tambora, 6) Cosiguina, 7) Krakatau, 8) Santa Maria, 9) El Chichon, 10) Mount Pinatubo



Graph 1 Decrease in the Earth's surface temperature between year 1194-2000 [2] compared to several large volcanic eruptions

METHODS

- Intentive analysis previously collected data between climate change based on a study done by T.J. Crowely in 2000, "Causes of climate change over the past 1000 years"[3]
- Comparative research analysis of earth's recorded temperature drops with recorded volcanic eruptions with a high intensity

CONCLUSIONS

- Majority of decreases on the Earth's temperature coincide with a massive volcanic eruption with a VEI of 5 and higher. Large volcanic eruptions increase a haze effect in the atmosphere
- Clouds developed by the eruption absorb solar radiation which causes the Earth to become cooler

FUTURE RESEARCH

- Earth keeping itself at equilibrium
- Develop a formula to specify a volcano's impact on global warming

REFERENCES

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