Eruptions of Mt. Vesuvius

Historical and Future?

Tragedies

CC 3.32, Lecture 3

Mt Vesuvius and Naples

Location of Mt. Vesuvius

Ruins of Pompeii

79 AD Population: ~20,000

Ruins of Pompeii
Casts of Bodies in Pompeii

- 1,150 bodies have been uncovered

79 AD Eruption of Vesuvius

- Vesuvius had not erupted violently in prior history
- Minor eruption in 217 BC (Plutarch)
- Precursor Signs:
  - Earthquakes
  - Drying of wells and springs in early August, 79 AD

79 AD Eruption of Vesuvius

- August 24 or 25
- Explosive eruption that lasted 19 hours
- 1 cubic mile of ash erupted
- Ash column was 20 miles high
- Winds blew southward
  - 10 feet of ash fell on Pompeii

79 AD Eruption of Vesuvius by Pliny the Younger

- "The cloud was rising from a mountain at such a distance we couldn’t tell which, but afterwards learned that it was Vesuvius. I can best describe its shape by likening it to a pine tree. It rose into the sky on a very long "trunk" from which spread some "branches." I imagine it had been raised by a sudden blast, which then weakened, leaving the cloud unsupported so that its own weight caused it to spread sideways. Some of the cloud was white, in other parts there were dark patches of dirt and ash."
79 AD Eruption of Vesuvius by Pliny the Younger

- "Ash was falling onto the ships now, darker and denser the closer they went. Now it was bits of pumice, and rocks that were blackened and burned and shattered by the fire."
- "The ground outside his room rose so high with the mixture of ash and stones that if he had spent any more time there escape would have been impossible. They tied pillows on top of their heads as protection against the shower of rock. It was daylight now elsewhere in the world, but there the darkness was darker and thicker than any night."

Plinian Eruptions

- Large, explosive events
- Eject enormous columns of ash (>11km tall)
- Ejecta is carried by the prevailing winds
- A few hours to a few days
- Mt. Vesuvius
- Mt. St. Helens
- Mt. Pinatubo

Plinian Animations

- http://www.sci.sdsu.edu/volcano/
- http://www.sci.sdsu.edu/volcano/flyby.mov

79 AD Eruption of Vesuvius

- 10 feet of ash fell on Pompeii
  - Winds must have been blowing southward during the eruption
- 38% of the 1,150 bodies recovered in Pompeii lie within the ash fall
  - Mostly crushed under collapsing roofs
  - Weight of pumice ash has been estimated at 476 lb/ft²
Volcanic Strata at Pompeii

79 AD Eruption of Vesuvius

- Ash fall was followed by a series of pyroclastic surges on the next morning
  - Ground-hugging, directed explosions
  - Super-heated gasses and pyroclastic debris
  - Asphyxiated the remaining people in Pompeii
    - 62% of the bodies in Pompeii lie within the surge deposits
    - Half of these were on the streets and half were indoors

Types of Pyroclastic Flows

- **Pyroclastic Flow**: A hot, chaotic avalanche of pumice, ash, and gasses. Pyroclastic flows can move at high speeds along the ground and pass over substantial obstacles. Their distribution is, however, strongly controlled by topography.

- **Pyroclastic Surge**: A turbulent cloud of volcanic ash and hot gasses, which hugs the ground and travels at speeds often exceeding 100 km per hour. Surge deposits are more widely distributed than pyroclastic flow deposits, although not as widespread as air-fall pumice layers.
The deposits reveal that after the Plinian eruption, Pompeii was hit first by a pyroclastic surge, leaving a deposit of 10 to 20 cm, closely followed by a pyroclastic flow that left a deposit varying in thickness up to 200 cm. Shortly thereafter, there was a second pyroclastic surge leaving a deposit of 10 to 20 cm, rich in fragments of limestone and dense volcanic rocks. Peléan Eruptions

- Explosive outbursts that generate pyroclastic flows
- Eruption columns are short
- First described from Mt. Pelee on Martinique
Eruptive History of Vesuvius

- 13 km caldera
- Formed 35,000 years ago
- Eruption of 80 km³ of ash
- Two historic eruptions

History of Vesuvius

Fig. 4: Group of tourists (left, in shadows) near the Craco and Orsomastron. They were encountered in the area and_pointer
s on the map. The tourists are seen from a distance of 6 km south of the area. The map shows the location of the

Phlegrean Fields

- 13 km caldera
- Formed 35,000 years ago
- Eruption of 80 km³ of ash
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Phlegrean Fields Caldera

Formed during an eruption in one week, beginning on September 28, 1538.

Monte Nuovo

- Volcano formed 4000 years ago
- Last erupted in 1198
- Boiling mud and sulfurous vapors

Solfatara

- Gradual change in ground elevation due to filling or emptying of a magma chamber
- Between 1968 and 1972, the Phlegrean Fields rose 1.7 meters
- Between 1982 and 1984, the Phlegrean Fields rose 1.8 meters
- Region still active
Current Threat?

Naples Population
~1 million people