The Science of Prediction
Monitoring Volcanic Activity
Monitoring Mount St. Helens
• https://www.youtube.com/watch?v=8eO-7qm7fiY
Signs of Volcanic Activity

- Eruption history
- Volcanic gas emission
- Heat and hydrothermal activity
- Earthquakes
- Ground deformation – uplift and / or sinking
Scientists use tools, many of which can be set up and left, to monitor volcanoes.
Monitors

Instruments radio their data to a field station or volcano observatory.
Lava flows on a map - Kilauea historical lava flows 1983 - 2014
Lava flows - Kilauea 2018

- May 3-4\textsuperscript{th}, Earthquakes ranging from 5.0-6.9 magnitude struck the main island.
  - 11 new fissures opened up on the island, spewing slow-moving lava.
  - The lava lake was also reported to be dropping, moving closer to water below
  - Neighborhoods and the National Park were evacuated
- May 17\textsuperscript{th}, Kilauea erupts
- May 21\textsuperscript{st}, lava from the eruption reaches the Pacific Ocean
Eruption History

Pyroclastic flows
Eruption History

Hydrothermal explosions
Volcanic Gases

Gas emissions

Vesicular basalt
Steam plume
Collecting gas samples
Volcanic Gases

Death by gases
Rate of $\text{SO}_2$ emission, Mount St. Helens
Heat and Hydrothermal Activity

Plumbing of hydrothermal systems
Formation of earthquakes by rising magma

Magma rises into reservoir beneath volcano

Rising magma and volcanic gases exert pressure

High pressure causes breaks rocks, triggering earthquakes
Earthquakes

Detecting earthquakes

Four Major Types of Seismograms

- Tectonic like Earthquakes
- Shallow Volcanic Earthquakes
- Surface Events
- Harmonic Tremor

10 Seconds

Satellite measurement of ground deformation 1996 to 2000
Measuring ground deformation
Deformation at Mount St. Helens
The Science of Prediction

Standard Volcano Icons

Ground-based Volcano Alert Levels

<table>
<thead>
<tr>
<th>Normal</th>
<th>Advisory</th>
<th>Watch</th>
<th>Warning</th>
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Aviation Color Codes

- Green
- Yellow
- Orange
- Red

Increasing level of concern

Unassigned (Insufficient monitoring to make assessment)
Your Task

• You will begin as part of one of three research teams
  ➢ Eruption history, hydrothermal activity, seismic activity

• You will then split up and join with other members of the research team to form a project team studying ground deformation data.

• Your team’s goal: use the information you learn as well as Google Earth technology to decide the most appropriate place to build a new research center in Yellowstone National Park
  ➢ Consider geologic impacts, environmental regulations, tourism, etc

• Accomplishing this task over the next two weeks will earn you 30 points towards your lab grade.

• The winning proposal, as voted on by other classes, will earn 20 extra credit points towards your quiz grade.