Mount Rustler: A Case-Study Activity in Volcano Monitoring

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OVERVIEW: The Mount Rustler Volcano Observatory (MRVO) activity is a volcanic monitoring and eruption prediction simulation that involves various geologic stations collecting near real-time data and comparing that to case-study data for predicting the eruption of the model shield volcano. Students are directly involved in all aspects of data collection, organization, interpretation, dissemination and decision-making. The assignment begins with an online worksheet introducing various methods of volcanic monitoring, given as homework and reviewed in class before beginning the simulation. The simulation is run and evaluated in class, followed by individual written reports assigned for homework. The homework portion of the exercise is estimated to take between 3 and 6 hours, while the in-class portion usually takes a full 3-hour lab period to complete. It can be broken into section for shorter class periods.

OBJECTIVES: After completing this assignment students will be able to:

- Describe and recognize the types of monitoring done on a variety of real world volcanoes
- Collect and process (using a spreadsheet) the volcano monitoring data on a simulated shield volcano model
- Compare collected data to the model volcano case-history and make a prediction of eruption hazards
- Disseminate information to the proper authorities as part of the volcano monitoring team or public figure
- Compare data from individual sites to the overall hazard-level of the volcano
- Execute decisions regarding the alert-level of volcanic activity and its threat to humans in the vicinity of the volcano
- Produce a written report to the proper authorities describing their process of data collection and interpretation OR
- Produce a written report to the public on their interaction with the Volcano Observatory staff as a member of the local government, media or private citizen.

SUMMARY OF VOLCANO MONITORING EXERCISE:

1. USGS Website-Based Volcano Monitoring Worksheet (Homework)
2. Mount Rustler Background & Case Histories (Reading Assignments) Provides for some meaning to measurements and description of the simulation exercise
3. Setup & Preparation
4. Rustler Volcano Observatory (organization & operation)
5. Spreadsheet and graph creation & use (data recording/ organization/presentation; analysis tool)
6. Station procedure instructions & practice measurements (Day 0)
7. Run the Simulation (data collection, interpretation and dissemination)
8. Analysis, Review and Assessment

STATION DESCRIPTIONS:

A. Mt. Rustler Volcano Observatory (MRVO)
- a. Director and Chief Volcanologist
- b. Volcanologists & other assistants
  - i. Hot Spring Temperature & pH (heat and acidity)
  - ii. Water Turbidity (muddiness)
  - iii. Tilt (inflation-deflation)
  - iv. Seismicity (magnitude & daily frequency)
  - v. Ground Deformation (fissure)
  - vi. Fumerole Gas Analysis (acidity/poison)
  - vii. Satellite Remote Sensing (visual)

B. Mayor – works closely with MRVO Director

C. Press – keeps "in the face" of the mayor and director and reports to the general public

D. General Public – keeps "in the face" of the Mayor, Press and if necessary, the MRVO Director

EVALUATION/ASSESSMENT:

A. Class Discussion
1. Observatory Team meeting to review results and input from the public;
2. Public feedback to Observatory staff;
3. Overall discussion of how doing the activity felt and what was gained by this hands-on experience versus the homework

B. Written Report (individual homework) - Preparation of a formal written report summarizing and extending the activity.

WHO:
MRVO Director reports to the Director of the U.S. Geological Survey
Chief Volcanologist reports to the MRVO Director
Volcanologists and other Station Assistants report to the MRVO Chief
General Public, Mayor and Press report to their representatives or constituents

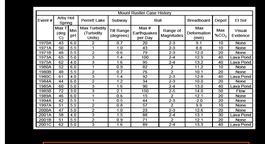
The style of the report is determined by the individual and is included as part of the report grade. The following parts must be included.

WHAT:
1. the procedures they followed (or didn't)
2. the type(s) of data they collected or obtained
3. the significance of that data
4. their agreement (or not) between the data and the timing of Alerts
5. the importance of what they did

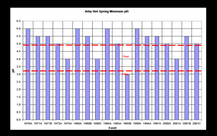
Possible Extension: View one of the following feature films, either before or after the simulation, and have them apply or evaluate their understanding of the events: *Super-volcano, Dante's Peak, Volcano.* These can be a great opportunities to bust some myths (a.k.a. address some misconceptions).

Examples of files: (see others in folders)

First page of the Internet Worksheet



Historical data "created" for Mount Rustler



Example graph of historical data

Example Instruction

Background Photograph by Steve and Donna O'Meara

Mt. Rustler Photographs by Scott Rockhold