Students Study Volcanoes

School: none
Teacher: Emmanuel Chaniotakis
No of students participated: 50
Subject domain: Environmental Education, Geography and Earth Science, Physics

Contact info

Feel

Addressed challenge:
This accelerator aims to shed light in the mechanisms of volcano eruption, provide students and schools with educational scenarios employing state of the art simulations and remote labs which can be used to help forecast the possibility of a volcanic eruption and finally provide students with the means and methodology to raise awareness regarding volcanic dangers. This way, the students are trained to become sensitive and informed citizens, responsive to the needs of their local community, who will be able to understand and in the future manage crises in a consistent and minimum-risk fashion.

Volcano eruptions can be identified as one of nature's most spectacular and simultaneously hazardous phenomena. In more than 1500 places of our planet where tectonic plates diverge or converge, the ground will shake and hot molten rock will surface from the depths of the earth, exploding in a burst of heat, emiting fast moving hot ash, toxic gases and rock and of course hot lava which flows destroying everything in its passage.

Fig.1: Image from the explosion of the Kilauea volcano in Hawaii in May 22, 2018

Fig.2: Lava from the Kilauea explosion expanding and destroying everything in its passage

Humans residing in the vicinity of active volcanoes live in constant danger. Their lives and lifestyles are centered around the fact that they live near the clutches of an unpredictable sleeping giant. The reality of a hasty evacuation, the potential for loss of human and animal life, the destruction of property, the environmental disaster and loss of any conception of safety are hard facts that citizens of volcanically active territories face in a daily fashion.

Fig.3: In January 2018, More than 80,000 citizens of the Philippines had to leave their homes due to the threat of eruption of the Mayon Volcano

Fig.4: Residents run away to escape from hot volcanic ash clouds engulfing villages in Karo district, Indonesia, during the eruption of Mount Sinabung volcano in February 2014. (Source: AFP)

Can those who do not live in the conditions of constant danger really comprehend the daily struggle that local citizens face? Humans cannot switch nature on and off. However, science provides us with tools which can help us minimize loss in life, destruction of property, and environmental disaster. What is the role of scientists in the reality of a forthcoming volcano eruption? How can citizens organize themselves and prepare for such a phenomenon? What is the role that the school, a hub of knowledge transfer and openness, could play in order to help ensure the wellbeing of local society?

Is it possible to raise awareness of people living in safer conditions regarding the daily hazards that volcano-neighboring communities face?

Imagine

Background knowledge acquisition

-In this part of the project, students get the background information on volcanoes, volcanic eruption mechanisms and on the existing methodologies regarding the monitoring and forecasting of the probability of a volcanic eruption focusing on the connection between earthquake monitoring and volcano eruption forecasting. They will be able to interact with experts on the fields of geology and volcanology in dedicated invited sessions in their schools or visits, virtual or physical, to associated research centers.

Fig.5 Drones observe lava flow in real time

The methods of forecasting the probability of a volcanic eruption include:

- Monitoring of seismic activity.
- Monitoring of thermal, magnetic, and hydrologic conditions.
- Topographic monitoring of tilting or swelling of the volcano.
- Monitoring of volcanic gas emissions.
- Studying the geologic history of a particular volcano or volcanic centre

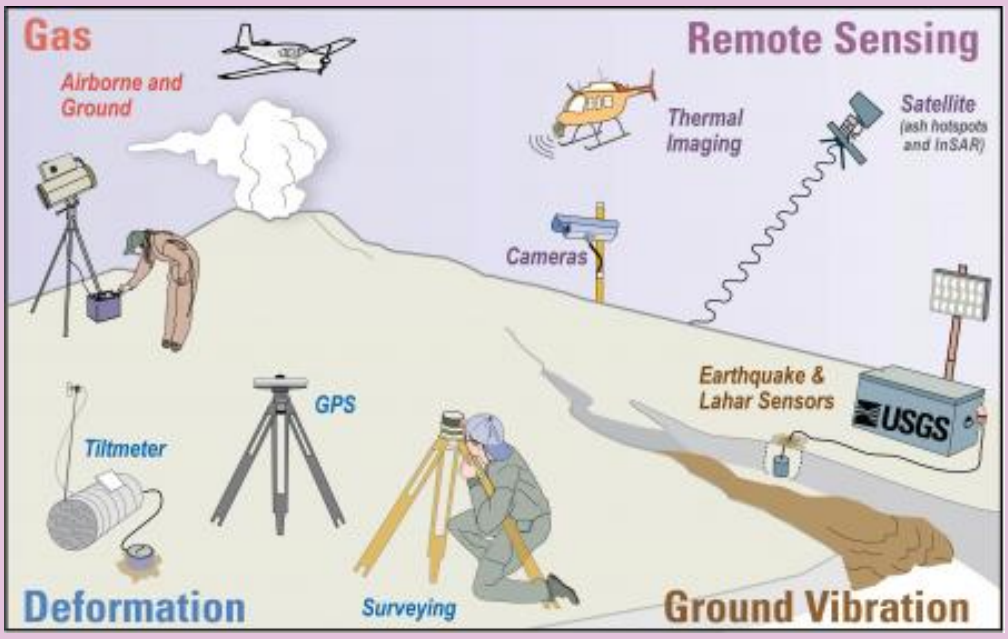

Fig.6 Methods of monitoring volcanic activity and forecasting volcanic eruptions

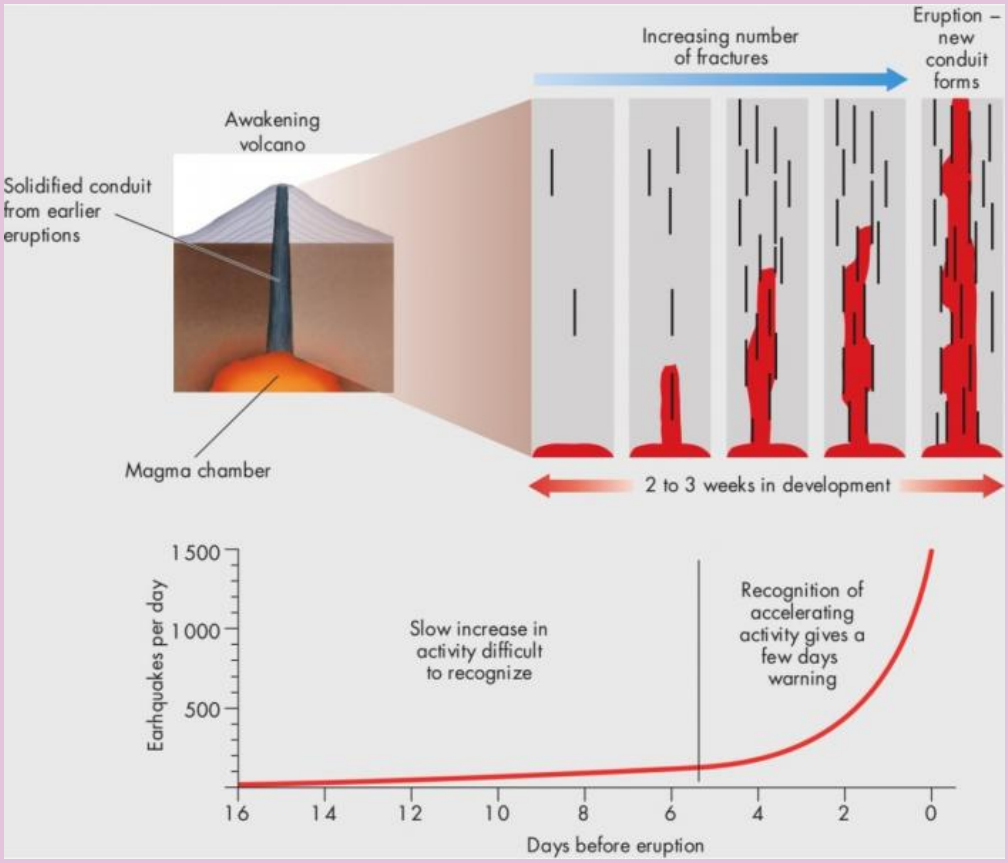

Fig.7 Correlating earthquake activity with eruption probability. A potential scenario.

- Students will analyze data from earlier volcanic eruptions and identify empirically the probability of a volcanic eruption based on evidence. Using these empirical data, they will run volcanic crisis management simulations utilizing available monitoring virtual tools to understand, in a hands-on fashion, the decision making process taking place in order to preserve human life during a volcanic crisis, while taking into account factors such as available budget and volcanic shelter healthcare conditions. Furthermore, students will utilize remote labs of seismic stations placed near volcanic regions and will be able to monitor in real time the earthquake activity near the volcanoes. (- Students will learn about the actions taken in countries with many active volcanoes such as Japan in order to issue warnings for volcanic activities to citizens.

https://www.jma.go.jp/jma/en/Activities/volcano_1.pdf
http://www.data.jma.go.jp/svd/vois/data/tokyo/STOCK/kaisetsu/English/level.html

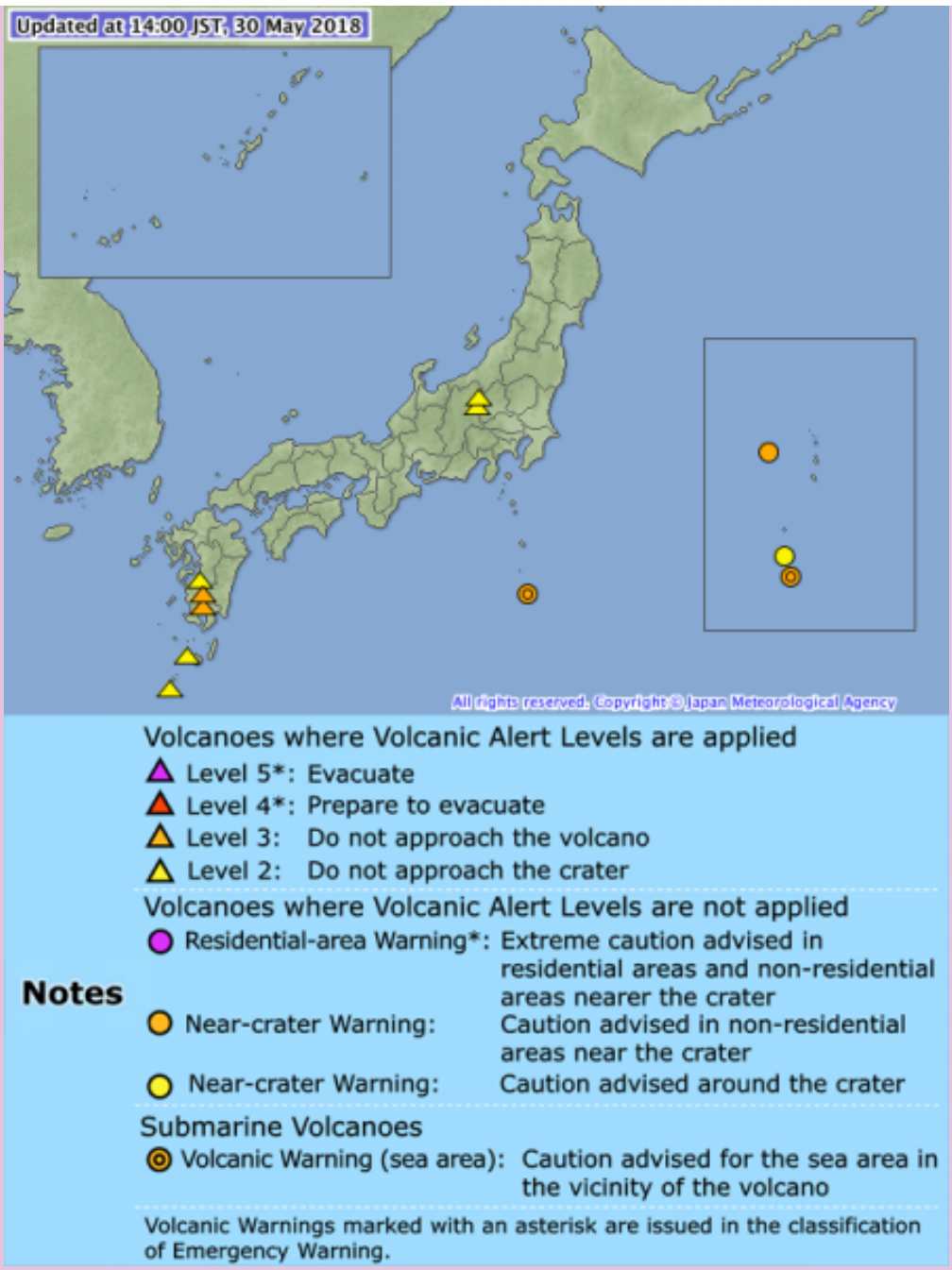

Fig.8 Volcanic warning in Japan. (Source: https://www.jma.go.jp/en/volcano/)

Identifying the problem and imagining solutions

Having obtained the background on the volcano eruption mechanisms and the eruption probability forecasting methodologies, students imagine how their school can act as a volcano monitoring, active participating and raising awareness citizen science hub and create their action plan to implement it.
To facilitate the creation of their action plans, students will forge contact with volcano and geoscience research institutions. This project also foresees inter-school collaboration during which students of schools in the vicinity of a volcano will communicate with students from faraway locations in order to exchange experiences and practices.

Create

A large number of activities will be organized by the participating schools, concerning volcano science and public engagement. The setting of priorities in the students' activities will depend on their geo-location with respect to a volcano.

- Schools located in the vicinity of an active volcano
could prioritize higher the active participation in community monitoring of volcanoes through data taking, the offer of help in evacuation community drills, the organization of informing sessions on volcanoes for students and local citizens with the systematic collaboration with local volcano observatories among other activities.

- Schools located far from an active volcano
could participate in volcano monitoring using remote labs, organize workshops in their school for the local community with presentations of their own and of invited speakers regarding volcano hazards and raise awareness through dedicated campaigns. They could organize virtual visits to volcano sites with the cooperation of schools in the vicinity of an active volcano.

Fig.9 Primary school students connect virtually and discuss with a volcanologist

Fig.10 Students organize visits to inactive volcanoes and understand the environmental impact of a volcano eruption to the local and global ecosystem. (Source: http://www.volcano-erasmusplus.eu/2016/12/04/turkish-students-visited-the-inactive-volcano-in-kula/)

Fig.11 Students prepare an exhibition to explain volcano science to the public and their classmates.

Fig.12 Students visit dedicated science centers on volcano science (http://www.volcano-erasmusplus.eu/2016/06/13/the-excursion-of-polish-students-to-the-land-of-extinct-volcanoes/)

Fig.13 Students in volcanic areas fly drones and get real footage of the volcano activity

Fig.14 Analyzing earthquake data to monitor volcanic activity

Fig.15 Getting in contact with volcano research institutions

Fig.16 Supporting evacuees affected by volcano eruptions (http://josephfeeding.org/disaster-relief/mayon-relief-outreach-taladong-evacuation-center/).

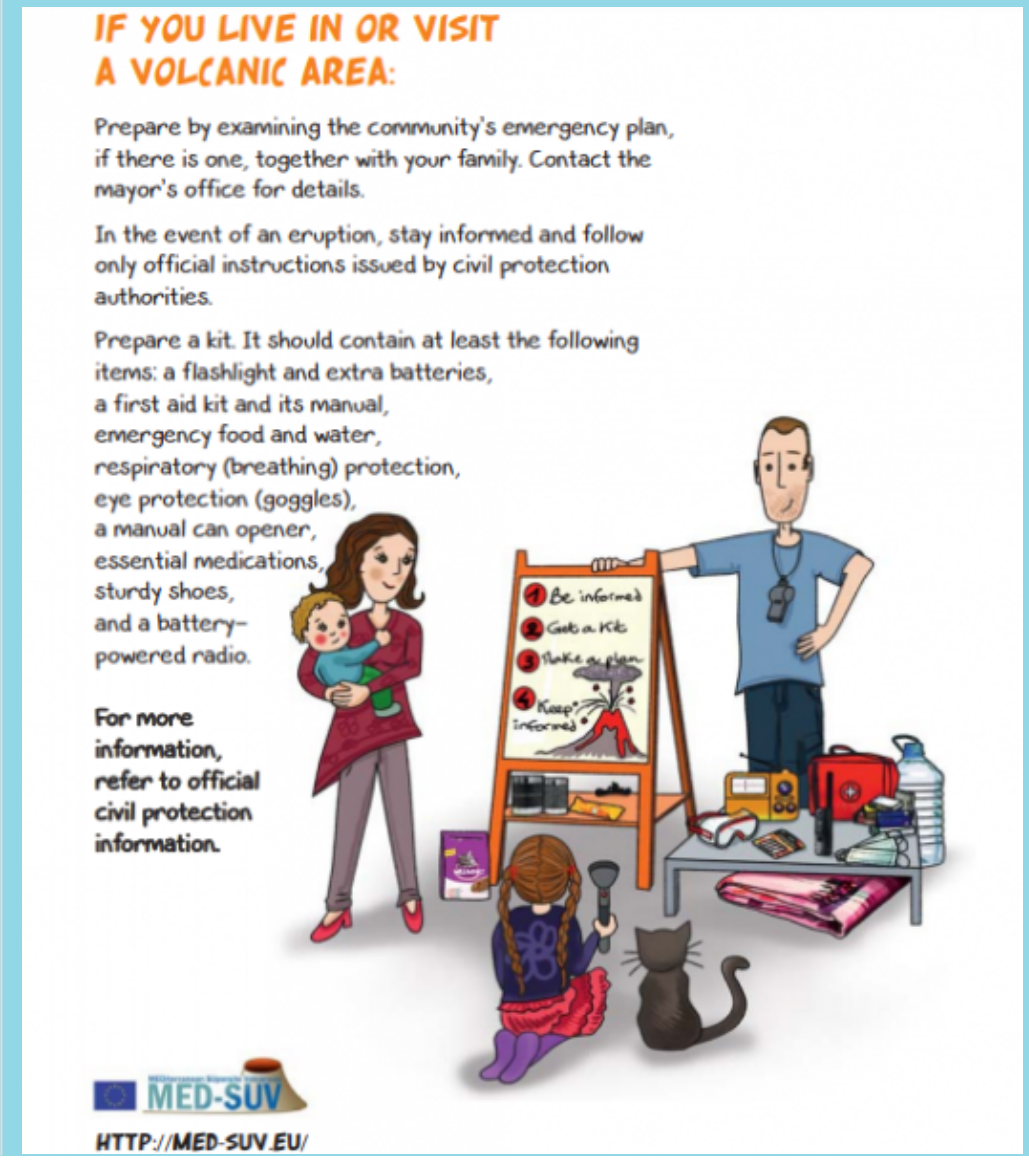

Fig.17 Estimating danger and creating flyers with guidelines for travelers in areas with active volcanoes (Source: http://www.med-suv.eu)

Students will keep an interactive logbook with which they collect material, notes, multimedia resources and also keep the minutes of their virtual meetings with other schools, experts and local stakeholders. By the end of the activity, students will compile their notes from the logbooks and create an informative video highlighting the course of their project.

At a later stage of the project, students could create a more permanent student-centered non profit company, aiming to monitor volcano activity, raise awareness and help in attempts for relief of citizens living in volcanic areas.

You can use the Restless Earth globallab project, to collaborate with other schools that are actively involved in the same project. This project has been created by Eleftheria Tsourlidaki on behalf of Ellinogermaniki Agogi.

Share

Students will create a blog and a group in social media with which they will be able to regularly update and share their project activity.

By the completion of the project, students will organize an infoday in their school to present their work regarding volcanic hazards and the role of the school in helping their community and raising awareness for the areas in constant danger of volcanic activity. The event should invite students, parents, educators, local stakeholders, expert scientists, natural hazards specialists, volunteers and local citizens.

The event could host invited talks, presentation of students' project results, of their compiled videos, of interviews with people affected from volcanoes, citizen debates, petitions for the support of volcano relief refuges and others.

Fig.18 Students invite volcano specialists and create events for the local community in order to raise awareness (source: https://dartnewsonline.com/79405/news/sta-and-rockhurst-students-attend-presentation-on-volcanoes/)

As a means for further dissemination, students will be encouraged to write articles in their school newspaper or in local newspapers, to participate in science fairs and festivals with their exhibits, videos and other material.

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