

Living in the shadow of Italy's volcanoes

What are the threats posed by Mount Etna?

Mount Etna erupts every 3-5 years and poses a considerable threat to the economy of the area (agriculture and tourism) and to nearby settlements, services and communications. About 25% of the population of Sicily live on the volcano's slopes.

The main threats posed by Mount Etna include:

- Lava flows – these are frequent and widespread although they do not pose a great danger to life due to their relatively slow movement. However, they can be destructive of property and infrastructure.
- Earthquakes – strong earthquakes associated with volcanic activity can cause damage to buildings and roads.
- Ash – this can cause problems for aircraft and ashfalls can have an impact on transport and farming.
- Debris avalanches – periodically volcano flanks can collapse triggering landslides and debris avalanches.

How is Mount Etna monitored?

Mount Etna is constantly monitored by scientists who can then issue warnings and implement evacuations if necessary. The volcano has been monitored for over 20 years by the Catania Section of the Istituto Nazionale di Geofisica e Vulcanologia (INGV).

As magma rises within the volcano it generates a number of warning signs that an eruption maybe imminent (Figure 1).

Figure 1

Measuring key volcanic eruptive indicators

Eruption indicator	Explanation	Measurement
Increased seismic activity within the volcano	As magma rises, rocks fracture generating earthquakes	Seismographs record earthquakes
Ground deformation	Rising magma can cause the volcano to swell	Tiltmeters measure changing angles and lasers can also be used to measure changes in fixed distance (as the volcano swells the distance between two known points decreases)
Magnetism/gravity	As dense magma (iron-rich) rises towards the surface, increases in magnetism and gravity can be recorded	Geophysical instruments can be used to measure magnetism and gravity

Monitoring Mount Etna

Gases	As magma rises, gases within the magma body are expelled	A gas spectrometer can measure gases remotely to detect changes and trends in gas emissions
Hydrology	Magmatic gases can become dissolved in water	Chemical measurements of water to detect dissolved gases and other possible indicators of an eruption

At the moment, the monitoring devices managed by INGV-CT are represented by permanent networks of remote sensors (e.g. seismic, magnetic, gravimetric and videos) in seismic and volcanic parts of Sicily. Satellites are being used increasingly to monitor temperatures and deformation. These devices are connected in real time, by radio and/or mobile phone, to the acquisition centre in Catania.

Data continuously recorded by permanent stations are also integrated by direct scientific observations, surveys and laboratory analysis of gases and groundwater chemistry to evaluate any threats posed by the volcano. This detailed monitoring enables scientists to predict the type of threat posed by an eruption and to pinpoint high risk areas on the volcano. This helps subsequent civil protection decisions to be made involving evacuations or access restrictions on the mountain.

One of the most successful predictive measures at Mount Etna has been the emissions of sulphur dioxide. This results from the de-gassing of magma as it rises within the volcano. It is monitored remotely using gas spectrometers and directly on the ground.

Questions

1. Access the Osservatorio Etneo Istituto Nazionale di Geofisica e Vulcanologia website at <http://www.ct.ingv.it/en/real-time-seismic-signal.html> to see the current state of the volcano's monitoring. Here you can see a live seismic feed and can access an Etna webcam. Explore the website to see what other information is available about monitoring Mount Etna.
2. You will find a map of recent earthquakes in the Mount Etna area together with the Aeolian Islands at <http://www.ct.ingv.it/ufs/analisti/maps.php> . Comment on the current seismic activity locating the epicentres of recent earthquakes.

Further References

A very thorough recent paper (2015) on volcano monitoring at Mount Etna can be accessed at <http://sp.lyellcollection.org/content/143/1/335.full.pdf> . This would be appropriate for A level study.

Specific information about monitoring Mount Etna can be found at:
<http://www.sveurop.org/qb/articles/articles/etna.htm>