

Living in the shadow of Italy's volcanoes

These questions can be completed on the first watch or watch the film through once then on the second watch pause at the times below for students to fill in their answers.

Introduction

Time: 0.38

1. What are the names of the two famous volcanoes in the Bay of Naples and Sicily?
Bay of Naples – Mount Vesuvius; Sicily – Mount Etna

Mount Vesuvius

Time: 1.35

2. Draw an outline sketch of Mount Vesuvius. Label the volcano, the crater and the vineyards at the base.

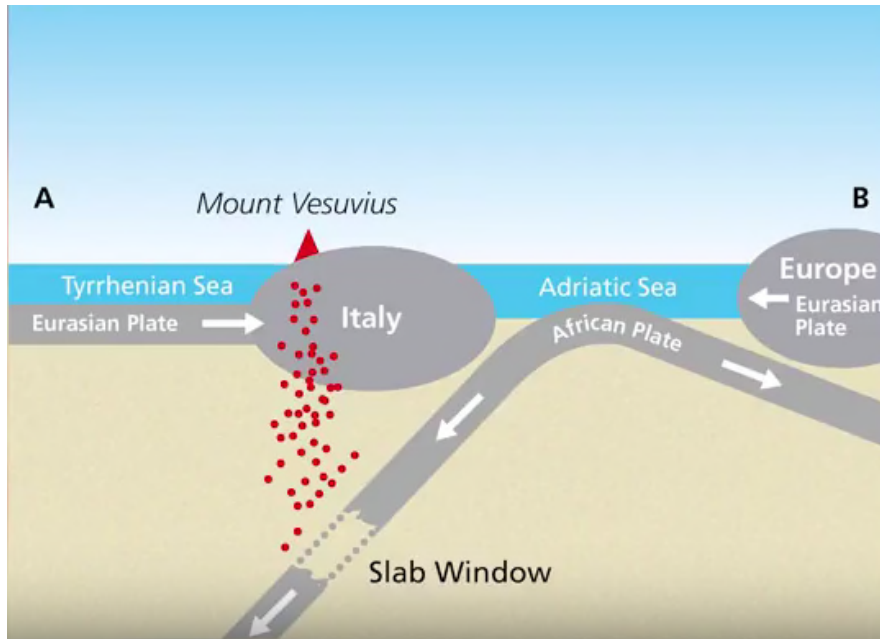
Time: 1.50

3. How many people live in Naples?
1.5 million in the city, 3 million including the suburbs
4. According to the official evacuation plan, how many people will be evacuated if Vesuvius threatens an eruption?
300,000
5. Why would such an evacuation be a challenge?
Narrow roads, congestion, traffic queues

Time: 2.48

6. Outline the characteristics and effects of the eruption of Mount Vesuvius in AD79.
 - **Eruption lasted two days, spewing rocks, ash and gas high into the atmosphere**
 - **The ash cloud collapsed to form devastating pyroclastic surges (temperatures exceeded 300°C) down the mountainside . . .**
 - **Devastated Herculaneum and Pompeii killing over 1000 people**

Time: 3:35



7. Explain the formation of Mount Vesuvius.

- The African plate is subducting beneath the Eurasian plate
- This forms viscous magma (rich in silica) which rises towards the surface
- High water content results in explosive eruptions that have formed the volcano

Time: 4:18

8. Describe the crater of Mount Vesuvius.

- roughly circular with very steep sides dropping down a long way
- lots of broken rock (scree) on the sides
- clear layers of lava exposed on the crater walls
- some evidence of steam high on the right side

9. What are the temperatures in the crater?

75-95 degrees Centigrade/Celsius

10. When did the volcano last erupt and what happened?

1944 . . . lava flows destroyed two nearby villages

Time: 5:38

11. Mount Vesuvius is carefully monitored by scientists. What are scientists measuring here?

- temperature and chemical composition of the gases
- seismic activity
- deformation

12. How deep is the magma chamber beneath Mount Vesuvius?

8-10km

13. Suggest why earthquakes indicate that magma may be rising beneath the volcano?

As magma moves up, it breaks and fractures the overlying rocks triggering earthquakes.

Napoli Sotterranea

Time: 7:27

14. How deep are the tunnels beneath Naples?

40m

15. Why were the tunnels dug by the Greeks and then extended by the Romans?

- The Greeks used the rocks for building the city
- The Romans created an intricate system of aqueducts and reservoirs to supply the city with water

16. The volcanic rock (tuff) was erupted 12,000 years ago from the nearby Campi Flegrei volcanic area to the west of the city. Why is this relevant to people living in Naples?

It suggests that Naples is not only at risk from a possible eruption of Mount Vesuvius but may also be at risk from an eruption from Campi Flegrei.

Solfatara and the Campi Flegrei

Time: 8.44



17. Describe Solfatara crater. How does it compare with Vesuvius?

- Broad and flat crater
- Quite different from the crater of Mount Vesuvius which is much deeper and not as wide
- Very white in colour
- Discontinuous crater rim

18. What is the evidence that the area is still volcanically active?

Presence of mudpools, fumaroles and heat

19. In the past, minerals such as sulphur, realgar and alum have been mined from the crater. Why were these minerals valuable?

Sulphur used to make gunpowder and fertiliser, realgar is used to supply arsenic – a poison – and alum used to fix colours in fabric.

20. Why does a boulder produce a loud 'boom' when dropped onto the crater's floor?

The rocks are porous – full of holes – which results in the drum-like 'boom'.

Time: 12.10

21. Apart from Solfatara, what are the other volcanic features in the Cami Flegrei volcanic area?

- Caldera rim, several craters, crater lakes such as Lago d'Averno, faults, young vents
- Monte Nuovo, 'new mountain' which is a small volcano

Time: 12:37

22. Describe and suggest reasons for the land use around the edge of the crater lake, Lago d'Averno.

Land is used for farming probably because the volcanic soils are fertile and there is a nearby water supply for irrigation in the summer

23. When was Monte Nuovo formed?

1538 in just one week

Pozzuoli

Time: 13:10

24. Parts of Pozzuoli show clear evidence of tectonic rising and falling of the land – a process called bradyseism. It results from the filling and emptying of a magma chamber deep underground. Describe the evidence of bradyseism in Pozzuoli.

- Columns in the Roman market show evidence of borings by marine molluscs which indicate that in the past the columns were partly inundated by seawater. Now the land is higher than the sea to once again expose the columns
- This rising and falling of the land and of sea level is evidence of bradyseism

Vineyard – Cantina del Vesuvio

Time: 15:06

25. Why are there vineyards on the flanks of Mount Vesuvius, an active volcano?

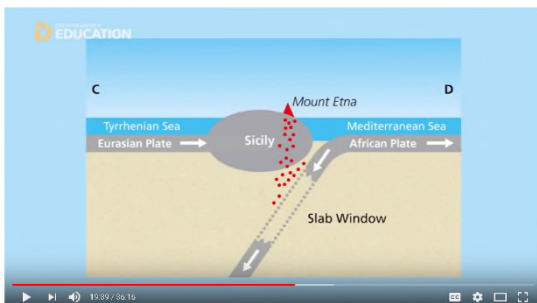
Very fertile volcanic soils and an excellent climate.

26. What is the purpose of the roses grown at the end of each row of vines?

The vines are organic and are sensitive to disease. Roses are extremely sensitive to disease and will show signs before vines so that action can be taken.

Sicily: Mount Etna

Time: 19:30



27. Why are eruptions of Mount Etna less violent than those of Mount Vesuvius?

The magma is more fluid – due to less silica – and this results in less violent eruptions.

Time: 20:15

28. Describe the effects of the 2002 eruption of Mount Etna.

Vast expanses of lava flowed over the area flattening trees and destroying buildings at the mountain ski resort, such as the Birch Hotel, ski stations, shops and chair lift

29. What are the special design features of the new shops that have been constructed in the area destroyed by the eruption?

They are designed to be portable, so could be moved away from the area if there is another eruption.

Time: 22:10

30. During the eruption in March 2017, a small explosion occurred beneath one of the lava flows. Describe what happened to the guide Giuseppe Barbagallo.

Hot rocks exploded into the air rained down on people burning jackets and causing some minor injuries. Giuseppe was hit on the head and had to have 10 stitches.

31. What was the temperature of the lava when it was erupted from the volcano in March 2017?

1000°C

Time: 25:20

32. What is a lava tube and how is it formed?

- A lava tube is a long cave through which lava flowed during an eruption.
- It forms on the ground surface initially but as the outer layers of lava cool a tube is formed along which the still molten lava flows.
- When the eruption ceases, the supply of lava stops and the lava tube is left empty.

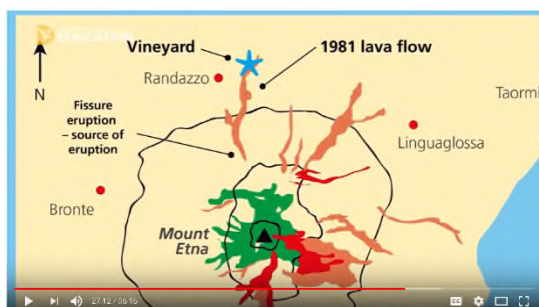
Time: 26:20

33. How did scientists attempt to divert the 1983 lava flow? Was it successful?

Explosives were placed along the edges of the lava flow to try to divert it away from a village . . . it didn't work.

The 1981 eruption of Mount Etna and the Fattorie Romeo Del Castello

Time: 27:08



34. Which small town was threatened by the eruption of 1981?

Randazzo

35. Describe the route of the 1981 lava flow.

Erupting from a fissure on the northern flank of the volcano, the lava flowed northwards just missing the town of Randazzo.

36. What were the impacts of the lava flow?

- Damaged houses
- Flattened trees
- Surged over vineyards and farmland
- Cut off roads and railways
- Took out telephone and power lines

37. Why were the owners of the Fattorie Romeo Del Castello concerned about the lava flow?

The lava threatened to destroy their home and the land on which they depended.

38. Why was this not a typical eruption?

Most eruptions happen at the summit of the volcano whereas this one happened at a much lower elevation on the flanks of the volcano.

39. How hot was the lava and how fast did it flow?

1200°C 100m per hour

Alcantara Gorge

Time: 31:00



40. Describe the Alcantara Gorge.

Very narrow, steep-sided gorge with a river flowing at its base.

41. How was the gorge formed?

By the river cutting through relatively weak layers of lava.

Aeolian Islands – Vulcano

Time: 31:56

42. Name the two active volcanic islands in the Aeolian Islands.

Vulcano and Stromboli

43. Complete the gaps in the following sentence.

'The Aeolian Islands form a volcanic ___island___ arc at the ___destructive___ plate margin between the ___African___ plate and the ___Eurasian___ plate. They have been formed over a period of ___260,000 years___.'

44. Describe the shape of the crater at Gran Cratere.

Circular and symmetrical, with a smaller crater within the main crater.

45. What is used to look for temperature changes in Gran Cratere?

Infra-red cameras.

46. Why is Vulcano popular with tourists?

People like to hike to the summit of the volcano or spend time in the nearby mudpools.

Museo Vulcanologica dell'Etna, Nicolosi, Sicily

Time: 34:05

47. What information is displayed in the museum?

- Real time camera images
- Thermal camera images
- Earthquakes
- Movement of magma and gases – indicated by minor tremors.

48. Why did scientists think the volcano was about to erupt?

A series of peaks in the movement of magma and gases inside the volcano.

Conclusion: Living in the shadow of Italy's volcanoes

49. Summarise the hazards associated with volcanoes in Italy by completing the table below.

Volcano	Hazards and impacts
Mount Vesuvius/Campi Flegrei	Violent explosive eruptions, with hot rocks, ash and pyroclastic flows. Collapsing ash clouds can cause devastating very high temperature (300 degrees Celsius) pyroclastic surges. Herculaneum and Pompeii were wiped out in AD79 with 1,000+ killed.
Mount Etna	Less violent eruptions but extensive lava flows that can destroy buildings, flatten forests, threaten towns, cut off services (roads, electricity, etc) and destroy farmland (e.g. 1981 and 2002).
Vulcano	Violent eruption with ash and pyroclastics ('lapilli' – small stones erupted from a volcano)

50. Summarise some of the benefits associated with Italy's volcanoes by completing the table below.

Volcano	Benefits
Mount Vesuvius/Campi Flegrei	Very fertile soils benefit farmers on the flanks of the volcano, especially vineyards. Rocks also used for building (e.g. tuff in Naples) and hewn out to provide water storage. At Solfatara, minerals mined - sulphur (gunpowder and fertiliser), realgar (arsenic) and alum (fixing colours in fabrics). Fertile soils around the shores of Lago d'Averno. Tourism.
Mount Etna	Lava used as building stone. When weathered, the lava produces very fertile soils hence the rich agricultural land (vineyards). Tourism (skiing, hiking, etc).
Vulcano	Tourism, particularly hiking and bathing in the hot springs and mudpools.