

## Case Study: The causes and effects of a volcanic eruption – Volcanic eruption Montserrat, 1997

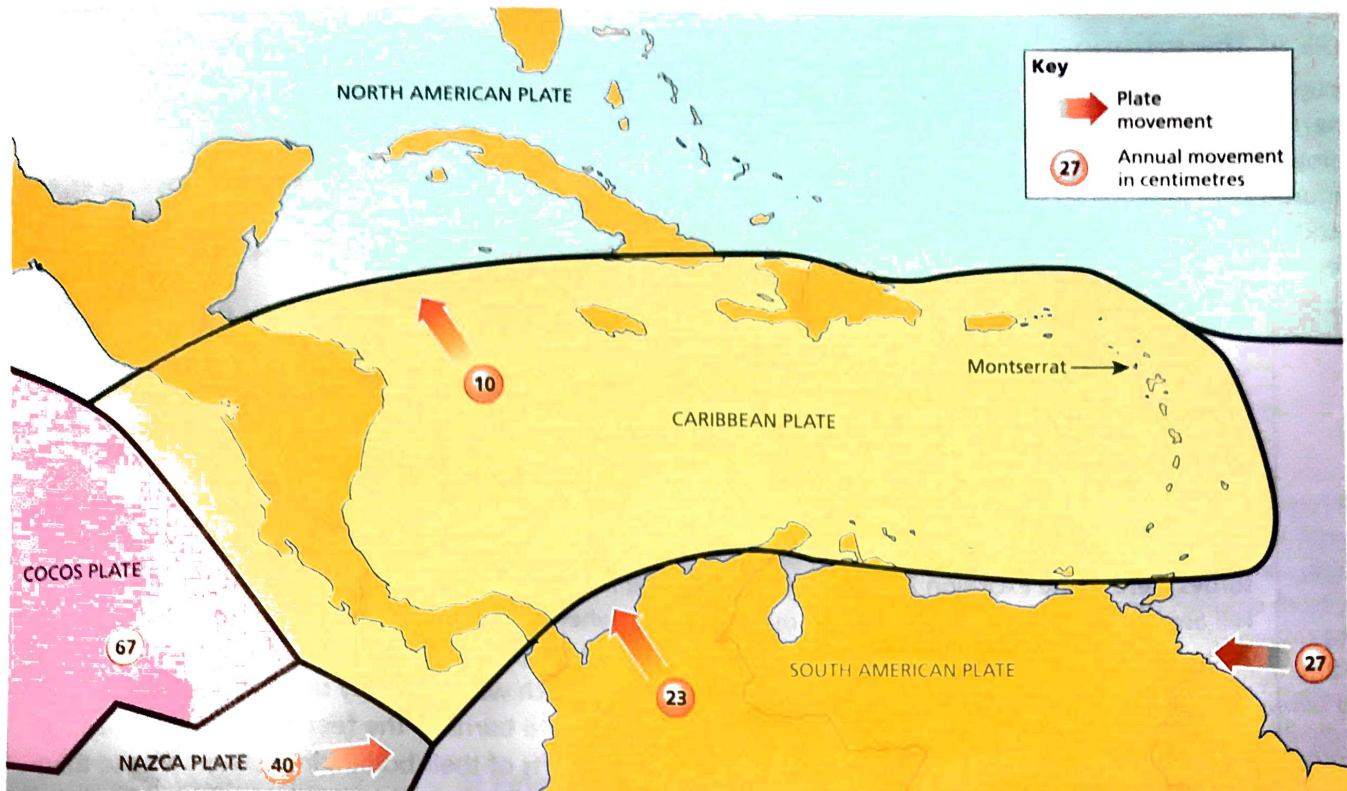


Figure 24 The causes of the Montserrat eruption

### The causes of the Montserrat eruption

The volcanic island of Montserrat is situated on a destructive plate boundary. A plate boundary occurs when two of the plates that make up the surface of the earth meet. The North American plate is slowly being forced under (subducted) the Caribbean plate. This happens because the oceanic North American plate is denser than the Caribbean continental plate. Convection currents pull the dense North American plate into the mantle where intense heat and friction causes the rock to melt. This molten rock is lighter than the surrounding rock, forcing it to rise through cracks in the rock towards the Earth's surface forming the volcanic island of Montserrat.

On 25 June 1997, at about 1 p.m., Chances Peak Volcano on the island of Montserrat erupted catastrophically. What made the eruption so catastrophic was that the volcano produced thick sticky lava called andesite. The lava is so thick that it builds up at the top of the volcano in a dome until it becomes too heavy and the dome collapses. As the dome collapsed, a huge ash cloud was formed. The ash cloud rose rapidly to a height of about 10 km. Strong winds blew the clouds of ash westwards over the island. Some parts of Montserrat suffered blackout conditions as the sun was obstructed by the ash cloud. As the ash cooled it fell back on to some parts of the island depositing ash 2–3 mm thick. Also when the dome collapsed hot rocks, gases and ash were ejected from the volcano causing pyroclastic flows. These are extremely fast moving and can destroy everything in their path.



## Effects of the eruption

The eruption on 25 June 1997 affected Montserrat in a number of ways. For the first time an eruption on the island killed and injured people. Villages were destroyed and land previously used for farming was covered in rock and ash deposits.

On 25 June 1997 some authorised people were in the Exclusion Zone to carry out essential tasks and monitor the volcanic activity. When an eruption looked likely all these people were able to evacuate safely by responding to the emergency sirens. Some unauthorised people were also in the Exclusion Zone. They were too far away to hear the sirens but thought they would receive audible warning from the volcano if it was going to erupt.

Unfortunately this didn't happen and many people were caught unawares. Nineteen people were killed by the pyroclastic flows. All the people who were killed or injured by the pyroclastic flows and surges were in the Exclusion Zone. Seven people were killed by the surge in the Streatham and Windy Hill area. Six of the victims were found outside houses where they had been attempting to seek shelter. Two other bodies were recovered from the pyroclastic flow deposits near Trant. The remaining missing persons are thought to have been in the village of Farm, which was buried by deposits several metres thick, and were never recovered. Common injuries were severe burns to the feet as a result of walking on ash deposits. Other survivors suffered burns to various parts of their bodies, including burns to the

nose and mouth due to breathing in the hot gases.

Of the 11,000 people who lived on Montserrat when the volcano first erupted in 1995, 7,000 had been evacuated. Almost 3,000 went to the neighbouring island of Antigua. The UK received nearly 4,000 evacuees and the rest went to the USA.

## Effects on transport

Montserrat was cut off from air travel in 1995 when the volcano destroyed Bramble airport. It was not until the new Gerald's Airport was reopened in July 2005 that international travel could resume. WinAir currently has four daily flights from Montserrat to Antigua and two daily flights to St Maarten. The tourist industry is still suffering with few visitors except for cruise ships looking at the volcano. Although the capital, Plymouth, was no longer occupied the port was still in use. The port was not destroyed by this eruption; however an emergency jetty was built in the north of Montserrat. Some people in the Exclusion Zone tried to escape using their vehicles but the ash was so thick that it was impossible to see the road. The intense heat also burned the tyres of the cars.

## Effects on buildings

Numerous villages were affected by deposits: Dyer, Streatham, Riley's Yard, Farrell's Yard, Windy Hill, Harris, Bramble, Bethel, Spanish Point, Farm and Trant were all affected.

The villages of Farm and Trant were completely buried by ash flow deposits. The eruption on 25 June 1997 destroyed 100–150 houses. Houses were partially buried or burned by the intense heat. Aluminium window shutters were melted and twisted. Everything made from wood was burned.

Other houses were destroyed by direct impact of rocks, up to 5 m in size. The houses destroyed were in the Exclusion Zone and should have been empty but an estimated 15 people were living and sleeping in the Exclusion Zone. These were mostly farmers. The farmers were producing crops to feed evacuees and believed that they were helping their country in crisis. Most land suitable for farming was in the south of the island, close to the volcano.

## Effects on the people

The eruption of the volcano should not have had a major impact on the people of Montserrat as the areas affected were in the Exclusion Zones. This zone had been set up after an eruption in 1995. Most of the people had been evacuated to the north of the island in 1995 and were living in makeshift shelters.



Figure 25 Ruined court house after the eruption



**Environmental effects of the eruption**

Figure 26 shows the environmental effects of the eruption.

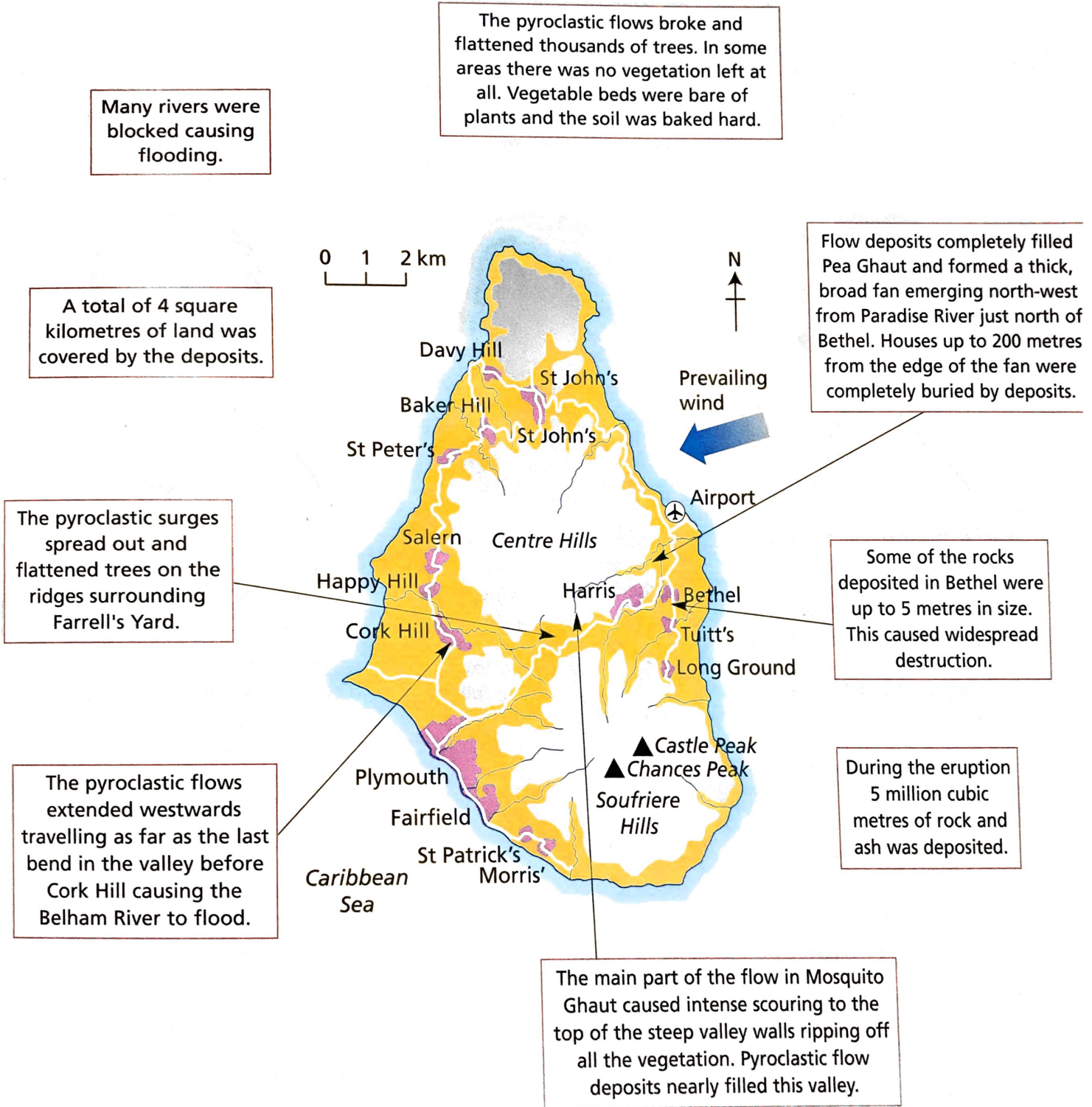


Figure 26 Environmental effects of the eruption

## Eyewitness reports of the eruption

Figure 27 describes some eyewitness accounts of the eruption.

We were going to leave in just a few weeks. Before this we had checked around in the north and there was absolutely no place to go. There was no place to rent. That is why we were still here.



Ash come up on the school field and cover the whole of Harris. There was one grey and black mighty cloud. Started to feel hot, hot, hot, like I was in an oven. The whole place turned black for about 20 minutes. The houses on the side of the road next to the ghaut were burnt.



My house in Streatham is burned. The house is burned flat, everything I had is gone. You can see here I don't get no burns (on his legs) I have long pants (trousers) on but I didn't have nothing on my foot. So from that I get damaged – if I had on my shoes I wouldn't have got damaged. I lose me toes and spend six months in hospital.



Went to Dyers almost 2 hours after the eruption. Had to stop the car because of ash on the road. I got out the vehicle and took a small stick and pushed it through the material on the road - it burned immediately where it went in about 3 inches. I went up further and pushed it into the flow. It did not come back out and it burned completely.



When I reach Dyer's corner rain shelter, me feel heat and see black stuff running down the road. Me feel the heat all over, me say "see how me foot burn down", me feel like me been in a fire meself. Got a lot of ash, shirt was full of ash, couldn't see the colour of the red shirt.



Figure 27. Eyewitness accounts of the eruption

## ACTIVITIES

- The movement of which plates were responsible for:
  - the Turkish earthquake?
  - the Monserrat volcano?
- Draw annotated pictures to show the environmental effects of the Monserrat volcano or the Turkish earthquake
- Were short- or long-term effects more damaging in the worst affected areas in Turkey?