



# VOLCANO watch

Sue Loughlin describes a timely volcanic collapse.

On 20 May 2006, the huge lava dome at the summit of the Soufriere Hills volcano on Montserrat in the West Indies collapsed, sending clouds of ash and gas 20 kilometres up into the atmosphere. Pyroclastic flows of hot gas, ash and rock swept out of the horseshoe-shaped crater into the Tar River valley, and small tsunamis hit Antigua and Guadeloupe. There were no casualties because seriously affected areas had been evacuated long ago, though significant damage was caused by massive clouds of ash falling on farmland and property.

Despite the misery of ash clean-up and the loss of animals and crops, this was a well-timed collapse given the circumstances at the volcano. If it had happened any later the consequences could have been much worse.

At the Montserrat Volcano Observatory (MVO), we have been monitoring this active volcano since it erupted spectacularly in 1995. We had watched the latest great heap of hot, gas-rich lava growing continuously since August 2005, and by May this year it had reached an impressive volume of 95 million cubic metres. The lava dome filled the crater and towered above the highest mountain on Montserrat, Chances Peak. It was growing

so fast that it was expected to grow over the top of the crater rim imminently and start threatening nearby populations to the north. It was so high above the crater rim that even a partial collapse of the summit area could have sent dangerous pyroclastic flows over the top. In the weeks before 20 May, the lava dome had fortunately been growing southwards, giving a brief respite to the local people, but a switch in growth direction was bound to come sooner or later. Growth was fast, earthquake activity was elevated and so were gas emissions.

In the early hours of the morning of 20 May we saw the dome glowing on its northern side, signifying a dreaded switch in growth direction towards populated areas. Heavy rain just before 6am was associated with mudflows and visible ash venting from the eastern base of the lava dome. We think that mudflows were eating away at the scree slope on the eastern side of the dome. Activity escalated rapidly and by 6.45 hot, fast-moving pyroclastic flows were escaping over the north-east crater wall and from the open east side of the crater and reaching the sea 3km away. The plume of steam, ash and gas reached heights of 2-3km. A dome collapse had begun.

British Geological Survey staff Thomas Christopher and Lee Jones surveying the huge lava dome on 18 May using terrestrial LiDAR. The volume of the dome was about 95 million cubic metres.



Pyroclastic flows are a common and devastating result of some volcanic eruptions. They are fast-moving bodies of hot gas, ash and rock that flow downhill like a fluid. The gas is usually at a temperature of 100-800°C. The flows normally hug the ground and travel downhill under gravity at up to 150kmph, their speed depending upon the gradient of the slope and the size of the flow. The hot gases and high speed make them particularly lethal.

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The British Geological Survey has been involved in the staffing and management of MVO since 1996. It holds a five-year contract with the government of Montserrat to manage the Montserrat Volcano Observatory.

#### Want to know more?

See the MVO website for the volcano's current activity and the work of the observatory, [www.mvo.ms](http://www.mvo.ms)

At 7.30 the volcanic activity intensified and at 7.36 an explosion sent a huge boiling cloud of ash and gas rapidly up to altitudes of 20km. Volcanic ash and stones began to rain down on residents causing temporary blackouts. The huge volumes of hot pyroclastic flows hitting the sea caused tsunamis up to one metre high in Antigua and Guadeloupe and there were explosive blasts directed from the sea back onto the shore. Residents to the north-west of the volcano reported very high levels of gas causing serious but brief discomfort, particularly to asthmatics.

The intense activity continued until soon after 8am when it began to reduce and by 9am there was only vigorous ash and steam venting from inside the crater that continued for the rest of the day. MVO scientists were able to see into the crater from a helicopter later in the day and it was clear that the whole of the lava dome including parts of the crater rim had been removed in the collapse. There was just a steaming empty crater floor – or so we thought, until we checked the

images from the infrared thermal camera. The camera could 'see' through the steam and showed a small, hot pile of lava at the base of the crater. The lava extrusion had not stopped. We already had a new dome growing on the scoured crater floor – and it was growing fast.

By the end of June 2006, this new dome was already over 30 million cubic metres in volume. It took more than six months for the August 2005-May 2006 dome to grow this big. It took this new dome just 40 days. The average growth rate from February to May had been six cubic metres per second (more than 25 cubic metres of lava per second at times) causing concern that explosive activity might occur. From May to August, the average growth rate has been eight cubic metres per second. The challenge for scientists is to understand why the volcano has started to extrude lava so fast after 11 years of eruptive activity characterised by average growth rates of about three cubic metres per second.

Our permanent group of scientists at MVO are joined by volcanologists,

seismologists, petrologists, geochemists and modellers from around the world in an attempt to understand the increased activity of this volcano. But it is the MVO staff who have the task of keeping the local Montserrat government, UK government and local population informed daily. The local authorities must manage the hazards and risks effectively 24 hours a day in order to continue to keep the population safe from this very active volcano.

Life goes on in Montserrat. Tourists are fascinated by the volcano and enjoy the excellent diving and hiking opportunities. There is pressure on the authorities to allow mining of sand and gravel from the flanks of the volcano. The lush Centre Hills are soon to become a national park, and a grand cultural centre is ready to open in the north.

Despite the drama of recent months, most people in Montserrat are thankful that the lava dome collapsed before it could spill over the crater rim, but at current rates the new dome could start to overtop the rim by September 2006.