The Volcano Behaves Itself—Sort Of

The Mount St. Helens eruption of 19 March demonstrated that volcanologists are becoming quite good, but are not perfect, at predicting moderate eruptions. A series of mixed signals from the mountain had left scientists leaning toward the likelihood of a quiet, dome-forming eruption. Instead, exactly when the quiet eruption was expected, a sharp blast rocked the southern side of the crater. The dome-forming eruption came the next day. In the future, scientists will place greater emphasis in public on their uncertainties about volcano prediction.

Scientists first started looking for the next eruption when earthquakes began occurring 5 to 12 kilometers beneath Mount St. Helens in February. Although tiny (most were smaller than magnitude 0), at the peak of activity dozens occurred each day. In addition, they were strangely out of place. Researchers had come to regard larger earthquakes at those depths as "sign-off" signals marking the end of explosive eruptions. Although nothing like this had ever preceded an eruption of any sort, researchers took these deep earthquakes as a sign that something might be different about this eruption, if one was actually coming.

Wide World

Mudflow from the 19 March eruption

By March, the behavior of the mountain began to look more familiar. Seismic activity shallower than 6 kilometers was on the increase, averaging about one earthquake greater than magnitude 1.5 every day. Ground deformation within the crater was picking up, too, as it had before previous dome-building eruptions.

On 12 March, the U.S. Geological Survey (USGS) and the University of Washington Geophysics Center released an official advisory warning that an eruption was likely within the next 3 weeks. "Deformation is confined to the crater area, suggesting that renewed dome growth will occur," it said. "The current seismic patterns differ from any observed before 1980–1981 eruptions, however, and raise the possibility of variations in the eruptive behavior, such as explosive eruptions or lava flows." Some members of the press, recalls Donald Peterson, scientist-in-charge of the Cascades Volcano Observatory of the USGS, mistakenly took that advisory to mean that another huge eruption like that of 18 May 1980 might be expected.

By the evening of 15 March, the familiar precursors of dome growth—increasing shallow seismic activity and localized ground deformation—had become more pronounced. The mysterious deep earthquakes had ceased. A new advisory narrowed the time of the next eruption to sometime within the next 1 to 5 days. Because "we were burned by the response to our first advisory," Peterson and his advisory group expressed their uncertainty about the style of the forthcoming eruption by simply describing it as "most likely of the dome-building type." The official release mentioned no alternatives to a quiet eruption.

The anticipated sharp increase in seismic activity—to 14 events greater than magnitude 1.5 in a 24-hour period—prompted an eruption alert at 9:00 a.m. on 19 March. Scientists expected an eruption within 24 hours. They once again described it as "most likely dome growth." Having heard no mention for a week of explosive eruptions, the press went with the story that scientists expected "a relatively peaceful dome-building eruption at any time," as the Associated Press put it, "rather than a violent explosion of ash."

Close, but not quite. At about 7:30 that night, a blast ripped out of the dome and smashed into the south wall of the crater. A plume of ash began rising to an altitude of 14,000 meters. It was the first significant explosive eruption since the one on 16 October 1980, which spewed 10 to 100 times more ash, according to Christopher Newhall of the USGS in Vancouver. The expected dome-building eruption, which had been emphasized in all eruption advisories, did begin Saturday night.

Scientists' predictions of the time of the eruption had been impeccable, down to a final warning sounded a few hours ahead when seismic activity increased to a rate of 120 earthquakes greater than magnitude 1.5 per day. But some in the press, Peterson says, chided the scientists for not anticipating the explosive nature of the first phase of the eruption.

The blast did catch researchers leaning the other way about the expected style of eruption, but "We were not a bit surprised that it was explosive," says Peterson. Although a dome-building eruption always seemed the most likely, explains Stephen Malone, an advisory group member at the University of Washington, they had been less confident about the outcome than they had been before other recent eruptions. Instead of being 80 to 90 percent sure of a quiet eruption, he says, they were only 60 to 70 percent sure. The closing of the red (danger) zone, which is not an automatic response to an alert, early on the morning of 19 March reflected their lessened confidence, he notes.

Members of the eruption advisory group are happy with their prediction, but they regret not having been able to convey a clearer sense of their uncertainty. "We tried very hard to mention that there were other possibilities," says Peterson, "but we probably overreacted to the distorted stories from our first advisory." Next time, he says, they will certainly put their qualifications in a prominent position in all advisories.—RICHARD A. KERR

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