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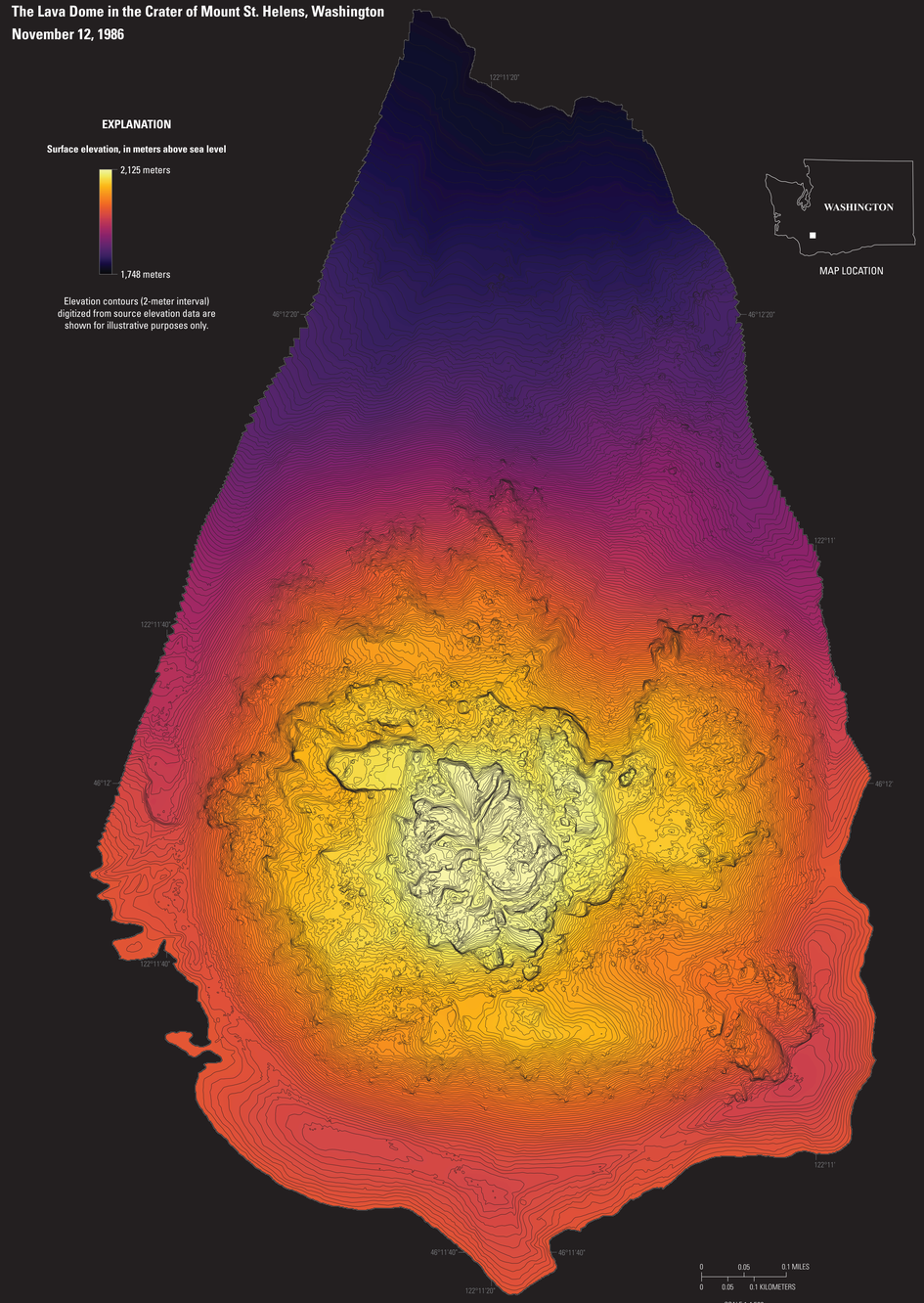
Rebuilding a Volcano One Lava Flow at a Time—Visualizing the Lava Dome-Building Eruption in the Crater of Mount St. Helens, 1982–1986

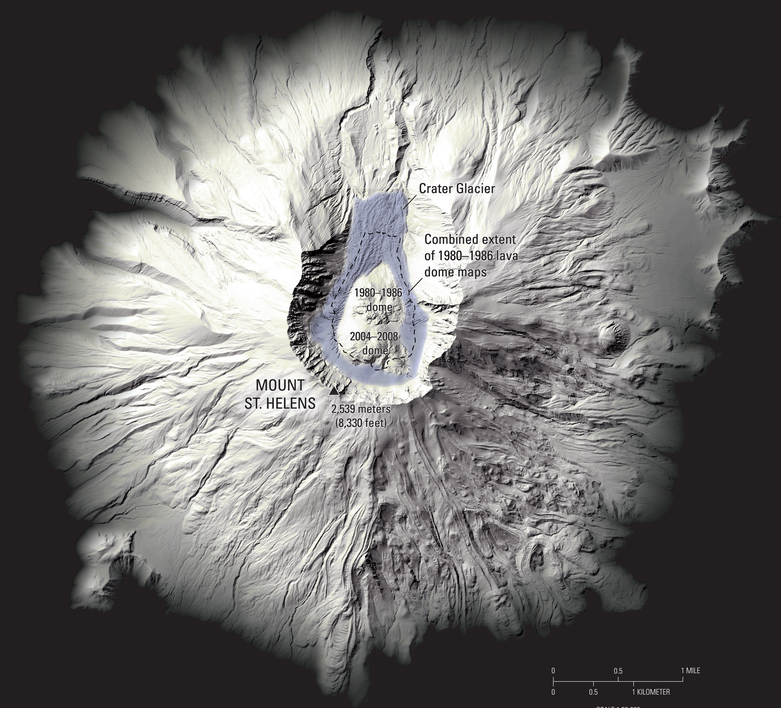
The catastrophic, explosive eruption of Mount St. Helens, Washington, on May 18, 1980, is the most well-known eruption of the volcano. Less well known is that shortly after the May 18 eruption destroyed the summit of the volcano, Mount St. Helens began to rebuild itself by erupting a new lava dome in the crater where the former summit once stood. Stratovolcanoes, like Mount St. Helens, grow through the accumulation of layers (strata) of erupted rocks, lava, and ash. Mount St. Helens is an active volcano; future eruptions could continue the rebuilding process and someday, a new summit may begin to rise above the rim of the crater.

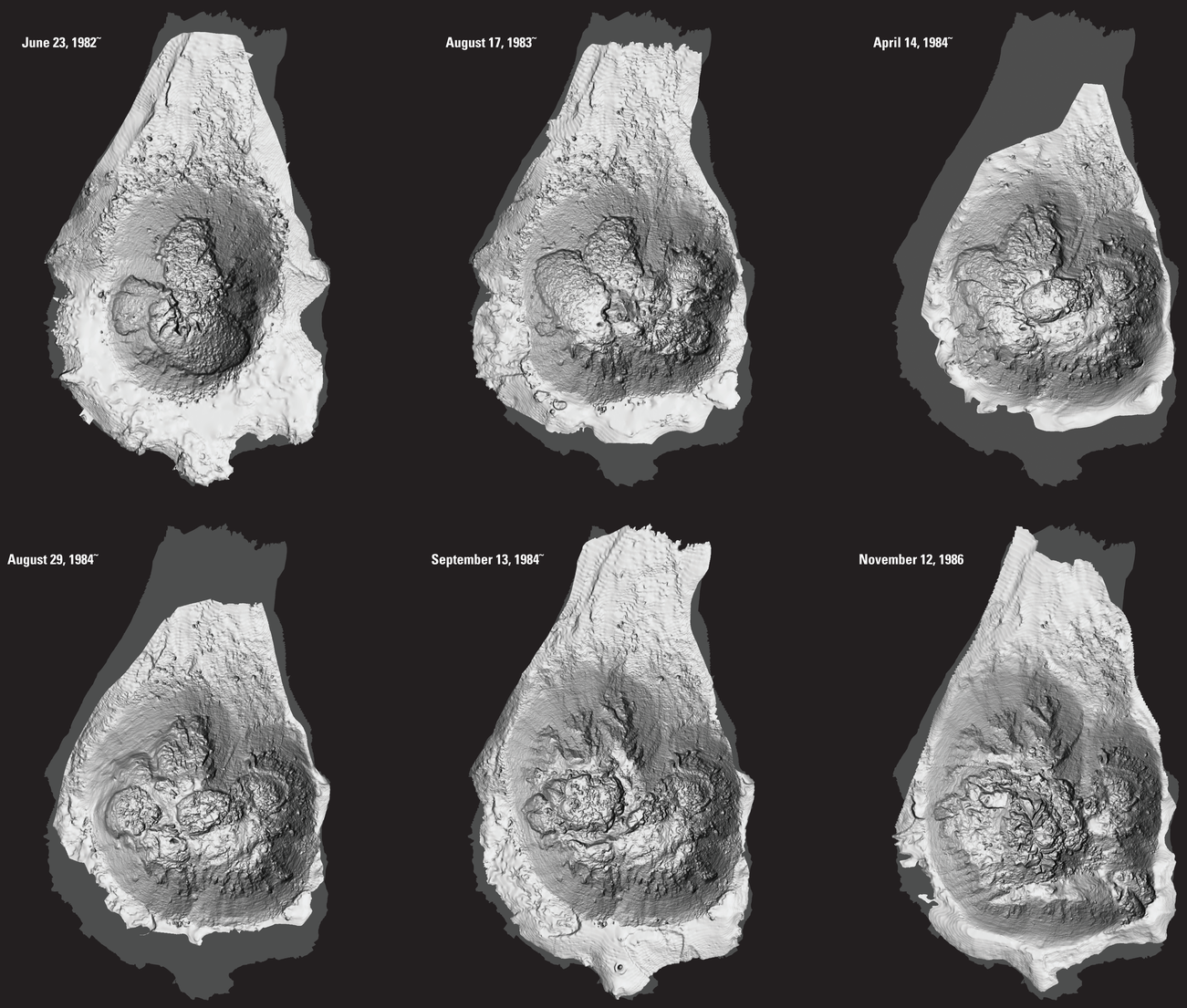
Beginning in October 1980, a series of 17 dome-building episodes erupted millions of cubic meters of lava, forming lava flows up to 396 meters (1,300 feet) long and 40 meters (130 feet) thick. During the initial phase of the eruption, from 1980 to 1982, the dome grew through periodic extrusions of stubby dacite lava flows, called lobes, at a rate of 1 to 3 meters per hour (3 to 10 feet per hour). By the end of 1986, a new lava dome reached nearly 305 meters (1,000 feet) above the crater floor.

Between 1980 and 1986, the U.S. Geological Survey made a series of 1:2,000-scale topographic contour maps from aerial photographic surveys to monitor the eruption. These maps were made for operational purposes and were not intended for publication. Since then, advances in technology made it possible to digitize the original, highly detailed hardcopy maps and derive new digital data elevation models of the surface of the lava dome. These digital elevation models allow for the visualization of the progression of the eruption and reveal the rubbly, chaotic surface of the lava flows and dome. Additionally, these new data help fill gaps in the long-term record of topographic changes that have occurred at the volcano since the May 18, 1980, eruption.

The Lava Dome in the Crater of Mount St. Helens, Washington
November 12, 1986







Above. The lava dome at different dates during the eruption. As the eruption progressed, new flows destroyed or buried older flows, changing the shape and increasing the volume of the dome. The grey polygon below each image shows the combined extent of all the lava dome graphics.

Above. Seismic installation in Mount St. Helens crater near lava dome, 1981. The U.S. Geological Survey, in conjunction with the University of Washington, maintains seismic stations at Mount St. Helens. An increase in seismicity (earthquakes) is often the first precursor to an approaching eruption. Photographer unknown, U.S Geological Survey.~

Left. Detail of Mount St. Helens showing the combined extents of the lava dome graphics overlying topography derived from recent U.S. Geological Survey elevation data. In September 1996, it was clear from photographs and observations that Crater Glacier had formed in the southern part of the crater. By 2004, the glacier had grown into a horseshoe-shaped feature that wrapped around the 1980–1986 lava dome. The volcano erupted again, creating the 2004–2008 lava dome immediately south of the 1980–1986 dome and beneath Crater Glacier. The new dome pushed ice more rapidly down the glacier's east and west arms. By March 2008, the arms merged and now Crater Glacier encircles both lava domes.

All maps are Universal Transverse Mercator, zone 10 north, North American Datum of 1983.

This map or plate is offered as an online-only, digital publication. Users should be aware that, because of differences in rendering processes and pixel resolution, some slight distortion of scale may occur when viewing it on a computer screen or when printing it on an electronic plotter, even when it is viewed or printed at its intended publication scale.

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Stanton, S.A, Dierker, B.C., Klug, J.G., Morrison, R.T., Bartee, L., and Bard, J.A., 2025, Digital elevation model of the lava dome in the crater of Mount St. Helens, August 29, 1984: U.S. Geological Survey data release, https://doi.org/10.5066/P1VNHJRD.

Stanton, S.A, Morrison, R.T., Klug, J.G., Rollo, P., Dierker, B.C., and Bard, J.A., 2025, Digital elevation model of the lava dome in the crater of Mount St. Helens, September 13, 1984: U.S. Geological Survey data release, https://doi.org/10.5066/P14R7EV.

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