Mount St. Helens Eruption Facts
Third Anniversary of the Current Eruption
September 20, 2007

The Ongoing Lava-Dome Eruption

- **Lava dome growth slows**—Lava-dome building eruption of Mount St. Helens continues, but at a slower rate than in previous years. Over the past year, the rate of lava extrusion declined from 0.6 cubic yards per second in December 2006 to 0.4 cubic yards per second in April 2007. This volume of extrusion is equivalent to emplacement of a small pickup-truck load every three seconds. Putting this growth rate in perspective, the rate has declined from 7.8 cubic yards per second for a short time during the early months of the eruption in 2004. However, the current extrusion rate is equivalent to the average growth rate of Mount St. Helens over the last 4,000 years. At the current rate of eruption (0.4 cubic yards per second), it will take a couple hundred years for the volcano to rebuild itself to its former volume. Approximately 7% or more of the volume of the pre-1980 volcanic cone has been replaced; approximately 11% of the present horseshoe-shaped crater has been refilled.

- **Reduction in earthquake activity**—Earthquake activity has decreased significantly during the past year, but continues above pre-September 23, 2004 levels. At this time last year, rising magma produced hundreds of earthquakes daily. Presently, tens of earthquakes are noted daily. The seismic signals are dominated by signatures from rock fall and glacier motion.

- **Lava dome growth continues, but no more whalebacks and spines**—Lava dome shapes have changed continuously since the onset of eruptive activity in October 2004. Early on we observed development of lava whalebacks (recumbent spines), which gave way in 2005 to the growth of sharp vertical spines, which alternately rose and then crumbled as rock fall. During 2007, the extrusion has evolved from the development of sharp spines to a less dramatic broad area of growth beneath the location of spine 7.

- **Rock chemistry consistent with previous findings—**Throughout the current eruption, lava composition has been remarkably constant. Rocks erupted between 2004 and the present have a slightly higher silica content than 1980-1986 rocks (65 weight % versus 62 -64 weight %), but they have distinctly different trace-element compositions and come from a shallower level of the magma reservoir beneath the volcano.

- **No change in eruptive style in the foreseeable future**—The low volcanic gas fluxes, constant rock chemistry, and low seismicity, deformation and extrusion rates all suggest little to no change in eruptive style in the foreseeable future. The

risks posed by the current eruption are relatively low. However, eruptions are inherently unstable situations and the USGS and the University of Washington's Pacific Northwest Seismic Network continue to monitor the situation closely.

Dome dimensions as of April 20, 2007

- **Lava dome exceeds volume of 1980-86 dome**—Maps from aerial photographs taken on April 20, 2007, indicate that the volume of lava dome erupted since October 2004 is 121 million cubic yards, an amount sufficient to fill approximately 163 Rose Garden Arenas (Portland, Oregon). Dimensions of the dome are 1,740 feet north to south, and 3,480 feet east to west. The high point is 7,569 feet above sea level. The April 20, 2007, lava dome area was almost 0.2 square miles. Volume of the new dome exceeds that of the 1980-86 lava dome (97 million cubic yards).

- **High point of dome 200 feet below Shoestring Notch**—The high point of the present lava dome is 1,290 feet above the 1986 crater floor. This is slightly higher than the height of the Empire State Building in New York (1,250 feet), and shorter than the Sears Tower in Chicago (1,454 feet). The 7,569 foot summit elevation is slightly lower than the 7,772 foot dome that grew during the summer of 2006. Vertical distance between the top of the lava dome (7,569 feet) and the Shoestring Notch (7,780 feet and lowest point on the crater rim) is 211 feet.

Crater Glacier

- **Arms of east and west side glaciers approach convergence—**At present, the growing lava dome is squeezing the glacier against the crater walls, causing ice to thicken and flow more quickly out of the crater. The two arms are moving generally northward, but obliquely towards one another, and their termini, in early September 2007, are approximately 180 feet apart. On April 20, 2007, the termini were approximately 400 feet apart. Between then and now, the glacier termini have advanced towards one another at a rate of approximately 0.7 feet per day.

- **Glacier thickness**—Glacier thickness in the upper section of the east arm exceeds 500 feet. Ice thickness at the terminus of each arm is approximately 60 to 130 feet.

- **Scientists remove seismic station Yellow Rock threatened by glacier**—In September 1981, University of Washington's PNSN scientists installed a seismic station within the crater that was dubbed Yellow Rock. At that time, no one could have foreseen that the station would survive the next five years of dome-growth activity, or that 26 years later it would be threatened not from rock but from ice. In early September 2007, USGS-CVO scientists dismantled Yellow Rock because of the threat of glacier ice, now just 100 feet away, from overrunning it or from a

large boulder melting out of the ice, tumbling down and smashing it. In September 2006, the glacier was 400 feet from Yellow Rock, but rapid movement of the glacier terminus over the past year made it seem unlikely that it would survive another year. In 2006 seismic station "Vault" was established in the crater at a greater distance from the glacier to augment the network.

- **Crater Glacier exceeds area of established nearby glaciers—**Area of Crater Glacier is approximately one-fifth the area of glaciated terrain that existed on Mount St. Helens prior to the catastrophic eruption of May 18, 1980. Crater Glacier is approximately 0.33 square miles in area, which is more than twice the area of White River Glacier on the south side of Oregon's Mount Hood. Crater Glacier is the newest glacier to form in North America. It is one of the most rapidly advancing and one of the lowest glaciers in the lower 48 states.

Science Nuggets

Volcanic eruptions provide unique scientific opportunities. Recent work produced these science nuggets.

- **Cameras provide close-up views of lava-dome growth**—During October 2004, scientists installed a time-lapse camera at Sugar Bowl on the northeast side of the crater mouth for the purpose of monitoring eruptive activity. This camera and one installed in 2005 on the summit rim have collected thousands of images that document the evolution of lava extrusions, first as whalebacks, then as spines and now as more general rise over a broad region. During 2006 and 2007 scientists installed additional cameras to support detailed analysis of dome movement. They are analyzing correlations between extrusion rates, tilt events and earthquakes.

- **Aeromagnetic Survey**—USGS scientists conducted an aeromagnetic survey to determine the distribution of hydrothermally altered rock and perched water. This work is similar to surveys completed at other Cascade volcanoes.

- **Electromagnetic experiments provide greater understanding of hydrothermal fluids beneath the crater floor**—USGS scientists conducted three weeks of electromagnetic experiments to learn about the circulation of hydrothermal fluids beneath the lava dome and crater floor.

- **Comparisons of Mount St. Helens and Bezymianny volcano, Russia—** The USGS is participating in a 5-year NSF-funded Partnership in Research and Education (PIRE) project on volcano monitoring science and education in collaboration with the National Science Foundation, the University of Alaska, and the Institute of Volcanology and Seismology (IVS) of the Russian Academy of Science. The project's theme is a comparison of eruptive activity and volcanic unrest at Bezymianny volcano, Kamchatka, and Mount St. Helens, Washington—

both of which underwent massive landslides (sector collapses) and related blasts and large eruptions (1956 at Bezymianny, 1980 at Mount St. Helens). On August 27- September 1, 2007 the USGS Cascades Volcano Observatory hosted a workshop for 15 Russian and American participants, including two members of the Russian Academy of Sciences, graduate students from the US and Russia, and scientists from IVS and CVO.

- **Plate Boundary Observatory (PBO) —**Borehole geophysical observatories: Mount St. Helens is now surrounded by four 800-foot instrumented boreholes, each about 5 miles from the crater. A strainmeter cemented into the bottom of each borehole can monitor expansion and contraction of the earth's crust around the volcano at the part-per-billion level. Just above each strainmeter is a 3-component seismometer, to take advantage of the quiet recording conditions. The very sensitive instruments in these deep boreholes are designed to detect subsurface movements miles beneath the volcano. The borehole observatories are funded by the National Science Foundation as part of the Plate Boundary Observatory component of the Earthscope program, and were constructed by UNAVCO, Inc., a nonprofit consortium of geoscience research institutions. Data are available to the public at: http://pboweb.unavco.org/?pageid=89.

- **New publication about Mount St. Helens will become available in 2008**—The USGS has documented a broad range of knowledge about the ongoing eruption in a new publication that is now in final editing stages. USGS expects to publish this document in early 2008.

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