

Definitions of Terms

Kīlauea Daily Eruption Updates

VOLCANO TERMS:

• **DI event:** "DI" is short for "deflation-inflation." A DI event is an abrupt deflation of Kīlauea's summit that lasts from several hours to 2-3 days, followed by an abrupt transition to inflation that effectively cancels the preceding deflation over the ensuing hours to days. DI events are best recorded by tiltmeters at Kīlauea's summit, which typically measure a few microradians (see definition below) of change for individual events.

DI events indicate a decrease and subsequent increase in pressure within a magma reservoir located about 1.5 km (1 mi) beneath the east margin of Halema'uma'u Crater. The level of the summit lava lake generally tracks tilt during DI events, with the lava level dropping during the deflation phase and rising during the inflation phase. Many DI events at Kīlauea's summit are also recorded, after a delay of minutes to hours, by a tiltmeter on the north flank of Pu'u 'Ō'ō on Kīlauea's East Rift Zone, which is a sign that the pressure changes at the summit are being transmitted through the magma conduit to the East Rift Zone eruption site. DI events sometimes correlate with pauses and pulses in lava output from East Rift Zone eruptive vents.

For more information, please go to:

<http://hvo.wr.usgs.gov/volcanowatch/view.php?id=117>

http://hvo.wr.usgs.gov/howwork/subsidence/inflate_deflate.html

• **Glow:** Light from an unseen source; indirect light.

• **Halema'uma'u Overlook:** This visitor overlook, located on the southeast rim of Halema'uma'u Crater, has been closed to the public since early 2008, when sulfur dioxide gas emissions increased to hazardous levels. After the summit vent opened within Halema'uma'u Crater in March 2008, the visitor overlook area became even more hazardous. High levels of sulfur dioxide gas can pose an immediate danger to health and life, and intermittent explosive eruptions blast rock and lava fragments (some large enough to cause serious injury or death) from the vent on to the crater rim.

• **Overlook vent or Overlook crater:** The informal name of Kīlauea Volcano's active summit vent. This vent is a crater within the floor of Halema'uma'u Crater, which, in turn, is within the floor of the larger Kīlauea caldera (also sometimes referred to as a crater).

When the summit vent first opened in March 2008, it was about 35 m (115 ft) in diameter. It has since enlarged due to collapses of the overhung vent rim, and, as of May 2015, was about 215 m (705 ft) by 165 m (540 ft) in size.

From November 2009 to present, the summit vent has hosted a lava lake that has risen and fallen dramatically over time, with lake levels that have ranged from about 200 m (655 ft) below the vent rim (e.g., in January 2010) to overflowing the vent rim (e.g., in April-May 2015). Lava lake level fluctuations—rising with summit inflation and dropping with summit deflation—are an ongoing process.

For more information, please go to: <http://pubs.usgs.gov/fs/2013/3116/>

• **Incandescence:** Visible light emitted from a hot surface. The color of the light is related to surface temperature. Molten lava displays bright orange to orange-yellow light from surfaces that

are hotter than 900 degrees Celsius (1,650 degrees Fahrenheit). Some surfaces can display dull red incandescence at temperatures as low as 430 degrees Celsius (806 degrees Fahrenheit).

- **Jaggar Museum Overlook (or observation deck)**: Perched on the rim of Kīlauea Volcano's summit caldera, about 1.6 km (1 mi) north-northwest of the active summit vent within Halema'uma'u Crater, the Jaggar Museum Overlook (observation deck) affords spectacular views of Kīlauea's summit vent activity. The Thomas A. Jaggar Museum is located on Crater Rim Drive in Hawai'i Volcanoes National Park about 4 km (2.5 mi) from the Kīlauea Visitor Center. For more information, please visit:

http://www.nps.gov/havo/planyourvisit/jaggar_museum.htm

- **Metric ton (t)**: A unit of weight or mass equal to 1,000 kilograms, 2,204.6 lbs, or 1.102 US (short) tons. Used to report gas measurements.

- **Microradian**: The amount of tilt or ground deformation on volcanoes is measured in microradians. One microradian of tilt is equivalent to the angle created by raising one end of a 1-km- (0.6-mi-) long board by the thickness of a U.S. dime (1 mm, or 0.04 in). More specifically, a microradian is a measure of angle equivalent to 0.000057 degrees. For more information about tilt, please visit:

<http://volcanoes.usgs.gov/activity/methods/deformation/tilt/>.

<http://hvo.wr.usgs.gov/kilauea/update/deformation.php>

http://hvo.wr.usgs.gov/volcanowatch/archive/2002/02_05_30.html

- **Tephra**: The general term for volcanic rock fragments exploded or carried into the air during an eruption. Such fragments can range in size from less than 2 mm (0.08 inches) to more than 1 m (3.2 feet) in diameter. The smallest tephra is called volcanic ash, pieces of pulverized rock and volcanic glass the size of sand or silt. Tiny ash particles can be less than 0.001 mm (0.00004 inches) in diameter. For more information about tephra, please visit:

http://hvo.wr.usgs.gov/hazards/FAQ_SO2-Vog-Ash/P2.html#ash

<http://volcanoes.usgs.gov/hazards/tephra/>

<http://volcanoes.usgs.gov/images/pglossary/tephra.php>

<http://volcanoes.usgs.gov/hazards/tephra/tephraterms.php>

- **Tonne (t)**: An old spelling for “metric ton,” a unit that is used to report gas measurements.

For more definitions of volcanic terms (with photos), please see:

<http://volcanoes.usgs.gov/images/pglossary/>

EARTHQUAKE TERMS:

- **LPs**: Long-period (LP) events refer to a type of earthquake with a drawn-out, wave-like pattern when viewed on seismic records (seismograms).

LP earthquakes are attributed to motion of fluids (gas, water, and/or magma) within conduits, cracks, and chambers beneath the ground surface, and have a gentler, rolling motion that is difficult for humans to detect. Most earthquakes that people feel are short-period events associated with rupture of a fault, with chaotic, rapid changes in ground motion.

On seismograms, LP earthquakes are recognized by the relatively even spacing between adjacent peaks on the record. This spacing—or period—can be between 0.2 and 2 seconds

(frequencies of 0.5 to 5 Hz), compared to short-period earthquakes, which are characterized by periods that are fractions of a second.

LP earthquakes are also known at other volcanoes as low-frequency earthquakes, tornillos, or B-type earthquakes

- **VLPs:** Very-long-period (VLP) events are earthquakes similar to LP events, but with much longer periods (that is, more time between adjacent peaks on a seismic record)—typically between 20 and 100 seconds (frequencies between 0.01 and 0.05 Hz).

If LP earthquakes are analogous to waves on the ocean, then VLP earthquakes are like ocean swells. VLPs can only be detected by specially designed seismometers, since the “shaking” is so gentle.

At Kīlauea, VLP earthquakes are common and associated with magma and gas migration through a constriction located near a shallow magma reservoir about 1.5 km (1 mi) beneath Halema‘uma‘u Crater.

- **Composite seismic event:** A composite seismic event records several processes occurring one after another—a combination of short-period, long-period (LP) and very-long-period (VLP) earthquakes that occur as part of a single, drawn-out event. These events have been recorded frequently at Kīlauea since the start of the current summit eruption in March 2008, and are usually associated with rockfalls into the summit lava lake (as seen by HVO cameras).

Composite seismic events typically begin like “normal” short-period earthquakes, with chaotic shaking indicating the occurrence of a rockfall and small explosion as the rockfall makes contact with the lava lake. After a few seconds, the seismic signature transitions to an LP event as gas is released from the upper part of the lava lake. The disturbance in the column of lava in the lake is felt all the way down to a small magma chamber beneath the summit, where it triggers the release of VLP energy that follows the LP event.

Thus, a composite seismic event begins like a normal earthquake, but transitions to an LP and then a VLP event, the latter of which can last for several minutes before the energy dissipates completely.

- **Volcanic tremor:** Active volcanoes are characterized by continuous release of seismic energy as fluids (magma, gas, and/or water) move through subsurface conduits, as gas is released from magma, and/or as lava erupts at the surface. This background seismic “hum” of the volcano is called volcanic tremor.

Volcanic tremor is frequently associated with gas and lava output and is often a sign that a volcano is erupting or is on the verge of erupting. Volcanic tremor is distinguished from earthquakes by its sustained nature, lasting from minutes to days and fluctuating in intensity, depending on the activity of the volcano.

Harmonic tremor refers to volcanic tremor displaying a steady or dominant period associated with ground shaking. Spasmodic tremor features bursts of energy.

OTHER TERMS / HAWAIIAN WORDS:

- **CD:** Hawai‘i County Civil Defense

- **Mauka / makai:** Hawaiian terms for directions relative to the coast. Makai or ma kai is toward the coast, and mauka or ma uka is toward the highlands, or away from the coast.

- **Pali:** Hawaiian term for cliff or precipice.