

## **Appendix A: Volcanic Events - Eruption Summaries**

**Kilauea**      **May 2018 - September 2018,  
December 2020 – May 2021,  
September 2021 – December 2022  
January 2023 – March 2023**

**Mauna Loa**    **November 2022 – December 2022**

## **April 2018**

Thursday 4/19/18 – “Pressure Growing Beneath Kilauea’s Puu Oo Cone Could Lead to New Vent, Lava Flow”:

- Hawaiian Volcano Observatory Station reports activity beneath Kilauea’s Puu Oo Cone.
- A Volcano Activity Notice warning was issued on Tuesday.

Thursday 4/26/18 – “Summit lava lake still overflowing into crater”

- Lava from Kilauea’s summit crater lava lake overflowed on Wednesday.
- Area around the Halemaumau summit vent was closed due to elevated sulfur dioxide emissions and possible rockfalls and explosions.

## **May 2018**

Tuesday 5/1/18 – “Crater floor collapse and increased quakes might signal impending lava outbreak, Kilauea scientist warn”:

- HVO official warn public that a collapse of the Puu Oo crater floor on Kilauea Volcano’s East Rift Zone has caused increased earthquake activity and may be a sign of a pending outbreak of lava flow.
- Scientists observed an increase in seismic activity and ground deformation at the PuuOo crater.
- County officials closed the Kalapana lava viewing area due to concerns of a pending eruption.

Wednesday 5/2/18 – “Kilauea has Hawaii County on alert”:

- Hawaii County Civil Defense was activated in response to seismic activity following Puu Oo crater floor collapse on Kilauea’s East Rift Zone.
- USGS scientists and Hawaii County Civil Defense were activated on Tuesday to monitor situation.
- Residents from Lower Puna, Leilani Estates, and Nanawale Estates felt some of the 200 or so small earthquakes. Largest earthquake peaked at 4.2-magnitude.

Thursday 5/3/18 – “Lower Puna residents warned as volcano rumbles and roads crack”:

- Cracks occur in roadways adjacent to Leilani Estates on Wednesday.
- Lack of heat and steam suggest lava is not going to burst from the ground just yet



*Cracks in road around Leilani Estates. Photo taken on 5/2/2018 courtesy of USGS.*

## Kilauea Volcanic Eruption Events (Summary of Honolulu Star-Advertiser Articles)

Friday 5/4/18 – “Nine Leilani Estate homes destroyed; lava fountains reach as high as 230 feet”, “Volcanic Gas a ‘Risk for everyone’ in the Area Near Lava Outbreak”, “Timeline of Earthquakes and Eruption of Kilauea on Hawaii Island”, “Red Cross Recommends Volcano Evacuees Pack 2-week Emergency Kits”, “FAA Imposes No-Fly Zone Over Lower Puna Due to Volcanic Activity”:

- Lava from Kilauea occurs at Lower Puna on Thursday afternoon around 4:00 pm.
- There are 10 active volcanic vents in vicinity of Makamae, Kaupili, Mohala, Kahukai Streets and Pohoiki Road.
- 2 new vents open in vicinity of Makamae, Leilani, and Kahukai Streets.
- Hawaii County Fire Department warns of extremely dangerous air quality conditions from high sulfur dioxide levels in evacuation area.
- On Thursday Ige activated the Hawaii National Guard to assist and provide security for the Big Island of Hawaii.
- Hawaii County Civil Defense pushed mandatory evacuations of the Leilani estates subdivision.
- Geologists say the flow is too unpredictable to make a flow model.



*Ash plume from PuuOo Crater of Kilauea on May 4, 2018 after magnitude 6.9 earthquake on Big Island. Photo courtesy of USGS.*

Saturday 5/5/18 – “Dangerous gas is adding to concerns on Big Island”, “70 Hawaii Guard members sent to Puna”, “As lava flies, nonemergency aircraft and drones are grounded temporarily”, “Lava eruptions and earthquakes rattle Hawaii island”:

- At least 6 fissures were active.
- 1,800 residents were evacuated starting on Thursday.
- Homes were claimed on Friday night.
- A 6.9 magnitude earthquake occurred on Hawaii island.
- FAA set a 5-nautical-mile no fly zone around Lower Puna for non-emergency aircraft.
- Evacuees complain about headaches and sore throats.
- Puna Geothermal Venture (PGV) was closed until further notice.

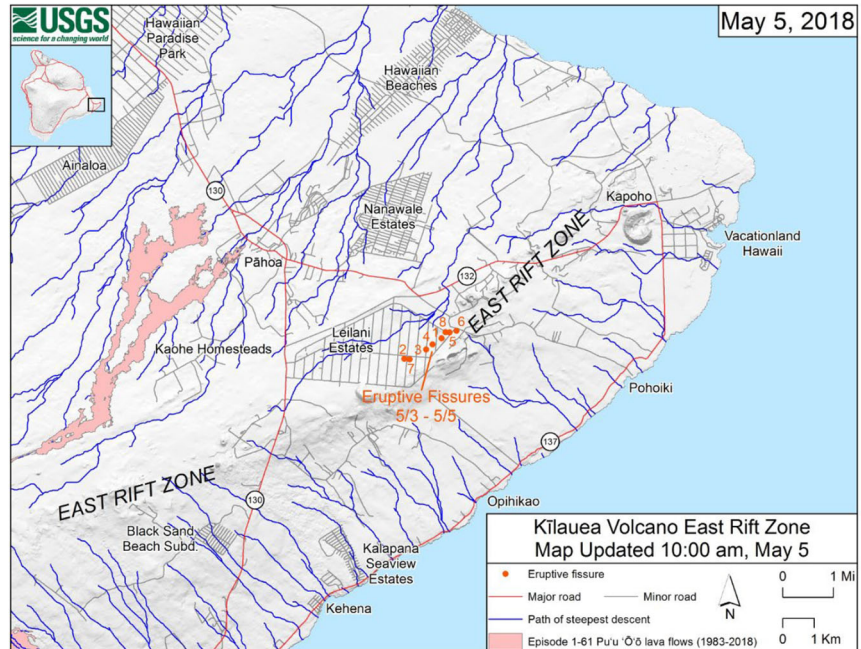


*Lava from fissure 7 on Hookapu Street in Leilani Estates subdivision on Kilauea Volcano's lower East Rift Zone. Photo taken on May 5, 2018 courtesy of USGS.*

## Kilauea Volcanic Eruption Events (Summary of Honolulu Star-Advertiser Articles)

Sunday 5/6/18 – “Kilauea delivers lava far from the source”, “Kilauea quiets down after fiery 2 days”, Residents of neighboring Hawaii island communities fear they will be next to feel Pele’s wrath”:

- 10-mile distance between Kilauea emergence of lava amaze and interest scientists and UH Manoa researchers.
- New cracks form in streets at Nanawale Estates.
- 8 fissures that destroyed 5 homes on Saturday had no major signs of activity.
- The 1,800 residents of Leilani Estates and Lanipuna Gardens subdivisions are still under mandatory evacuation.



USGS map showing locations of fissures in order of occurrence at the Leilani Estates Subdivision. Old lava flows are shown in pink.

Monday 5/7/18 – “Vog possible for Oahu later this week”, “Science explains Kilauea, a volcano oozing hot lava for decades”, “Big Isle mayor opens county eruption information center”, “Some Leilani Estates residents stay put despite evacuation order”, “Lava advances and destruction rises in Leilani Estates and Puna”, “Number of residents evacuated is unclear”:



View of lava lake at the summit of Kilauea Volcano. Photo taken May 6, 2018 courtesy of USGS.

- Vog from the Kilauea Volcano eruption on the Big Island could reach smaller islands in the state this week.
- Molten rock is called magma when it is underground and lava at the surface.
- Some residents were let back into the subdivision to retrieve home items.
- Volcanic activity has subsided at all fissures. However, hazardous fumes remain.
- 12 fissures have emerged.
- 35 structures have been destroyed.
- Hawaii County Civil Defense indicated that fissures are showing signs of intense magma activity and that lava flows are extending further from the fissures.
- Officials are reevaluating safe zones due to the intensity of sulfur dioxide.

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Tuesday 5/8/18 – “Lava claims 36 structures, mostly homes, in Leilani Estates”, “Ige meets with FEMA, expects eruption will qualify as major federal disaster”, “Federal disaster declaration iffy, governor says”, “With no new fissures breaking out, residents in lava zone scramble to collect belongings”:

- New vents 13 and 14 at Leilani Estates continue to release noxious gases.
- HVO confirms a new 15<sup>th</sup> fissure is actively erupting at Lanipuna Subdivision.
- Highway 130 was closed on Monday after cracks were discovered.
- Puna Geothermal plans to move 60,000 gallons of pentane off its property.
- Monday was the second day residents were allowed back into homes to retrieve items.
- Scientists say it is impossible to predict what will happen next. However, magma in the rift suggests the eruption will continue.
- Ige reached out for federal help, but the financial threshold was not reached.

Wednesday 5/9/18 – “Big Isle electricity provider restoring power to some Leilani Estates customers”, “National Guard troops monitor latest fissures for dangerous gases”, “New seismic activity in Puna suggests magma is once again on the move”, “Remain vigilant on air quality, health official advise public”, “Humane Society and Big Isle residents scramble to save pets left behind”:

- Despite the nearby Puna Geothermal Venture plant shutdown, Hawaiian Electric said it still has enough power generation to meet the island’s needs. The geothermal plant typically provides about 25 percent of the island’s electricity.
- Puna Geothermal Venture completed its move of more than 60,000 gallons of pentane to higher ground.
- A gas monitoring unit from the Arizona national guard along with 4 new sulfur dioxide monitors arrived on Tuesday.
- State Department of Health said vog and sulfur dioxide are not threatening public health beyond the evacuation zone. People are encouraged to remain vigilant and monitor the Hawaii Interagency Vog Information Dashboard at [www.ivhnh.org/vog/](http://www.ivhnh.org/vog/).



*View of ash from Kilauea summit vent. The explosions was caused by rocks falling from from steep walls of the crater. Photo taken on May 9, 2018 courtesy USGS.*

Thursday 5/10/18 – “Governor takes action to secure power plant”, “Vog and acid rain add to Big Island concerns”, “Disaster may be brewing at Kilauea’s summit”:

- There are new concerns about boulders and ash being ejected from Kilauea’s summit.
- Ash fall and acid rain add to the concerns.
- The 15<sup>th</sup> vent opened Wednesday afternoon.
- Police have evacuated 10 more homes on Alaili Road.

## Kilauea Volcanic Eruption Events (Summary of Honolulu Star-Advertiser Articles)

- Kilauea’s lava lake at the summit was ejecting debris and ash into the air.
- Scientists say the current patterns are similar to the 1924 eruption.
- Ige declares emergency powers over Puna Geothermal Venture to form a team for addressing the removal of flammable pentane from the property.

Friday 5/11/18 – “Governor Ige asks President Trump for federal declaration”:

- Governor David Ige asked President Trump to declare Hawaii a major disaster area on Thursday.
- Fears were eased at 3:15 am Thursday when PGV completed moving its 60,000 gallons of pentane from its property.
- Ige’s team is considering how to deal with the PGV deep wells filled with hydrogen sulfide and other gases. Plans to fill the wells with water to prevent a blowout would require equipment that would need to be shipped from California.
- There are concerns about possible explosions at Kilauea’s summit as the lake level continues to fall.

Saturday 5/12/18 – “New fissure reported, residents ordered to evacuate”, “President Trump’s declaration paves way for funding as officials plan for more possible eruptions and evacuations”:

- Minor spattering activity from a 16<sup>th</sup> fissure is diminishing.
- A 17<sup>th</sup> fissure has opened up, with steam and lava splatter activity.
- Residents of Halekamahina Loop Road have been ordered to evacuate after an 18<sup>th</sup> fissure was verified by the Department of Public Works and police.
- President Trump declared the volcanic eruption a “major disaster” which provides the state with federal assistance for disaster response and relief.
- The Hawaii National Guard, Task Force Hawaii, and active-duty Army members at Pohakuloa Training camp are available for evacuations.
- The East Rift Zone was considered to be at greatest risk of a new eruption.
- Surveyors and scientists were removed from East Rift Zone.



*Aerial view of fissure 16 located in vicinity of PGV at the upper right corner of the picture. Photo taken May 12, 2018 courtesy Hawaii County Fire Department.*

Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Sunday 5/13/18 – “Many accept their fate at the hands of Pele”, “County shuts down vacation rentals as residents are left to deal with more lava outbreaks”:

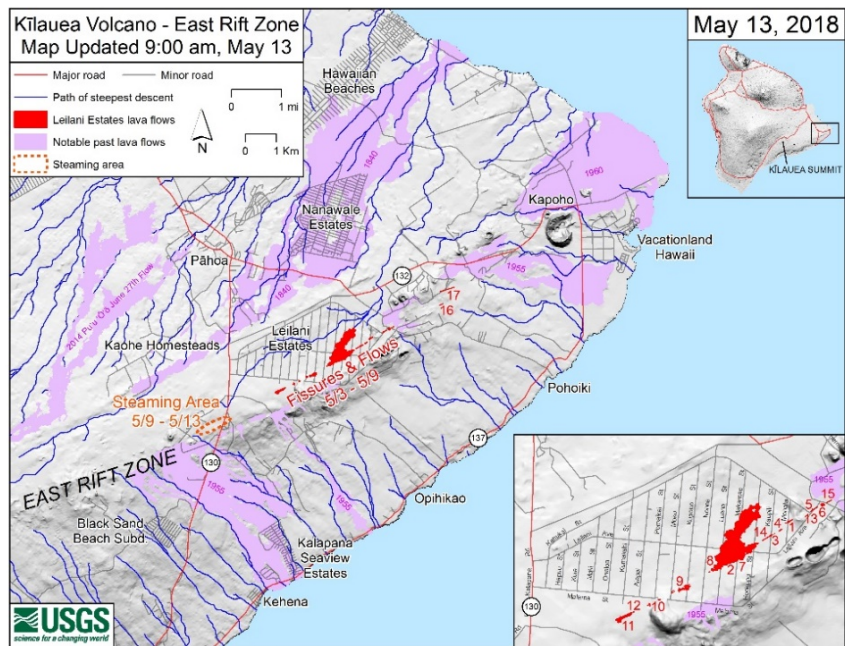
- Pele was referenced as the force behind Kilauea’s eruptions which have been ongoing since 1983.
- All vacation rentals were ordered to cease operations in the Lower Puna area until further notice.
- Residents in shelters total about 380 according to the American Red Cross.



View of lava spatter from Fissure 17. Photo taken May 13, 2018 courtesy USGS.

Monday 5/14/18 – “Hawaii Health Department’s crisis line available for Kilauea eruption victims”, “Pride of America skipping Big Isle port calls due to ‘adverse conditions’”, “2 more Kilauea fissures open as scientists look for aggressive flow”, “Evacuees get a brief respite from Kilauea’s eruption”:

- The Crisis Line of Hawaii is available, toll-free, at 1-800-753-6879, 24 hours-a-day, seven days a week.
- Norwegian Cruise Line announced it won’t make calls in Big Isle ports this week.
- Lava from fissures 17 and 18 is moving closer to Highway 132.
- Lava has destroyed 37 structures.
- A newer type of lava that moves faster could be flowing out of new fissures.
- USGS continues to warn about explosions on the summit as tremors continue, rocks fall into the lava lake, and lake levels fall below the water shed.



USGS map showing location of fissures in order of occurrence and lava flows. Lava from previous flows are shown in violet with event dates. Steaming area is shown with dots. New lava flows are shown in red.

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Tuesday 5/15/18 – “As lava destroys Hawaii homes, owners ask, Am I covered?”, “Tourism losses mount across the Big Island”, “Escape road threatened, geothermal wells to be killed as lava approaches”:

- Another fissure that opened up last weekend is sending lava toward the ocean at about 20 yards per hour.



*Ash plume from Halemaumau crater. Arrow shows dark area is where ash is falling from the ash plume to the ground. Photo taken May 15, 2018 courtesy USGS.*

- An ash plume from within Kilauea Volcano's summit crater rose as high as 12,000 feet above sea level.
- Lava approaching a coastal highway slowed, giving hope to keep that highway open for emergency evacuations should the need arise.
- Plans to kill the geothermal wells with cold water and install iron caps to keep pressure on chemicals inside the wells.
- Lanipuna Gardens was evacuated Monday as air quality was deemed potentially lethal.
- Tourism losses mount as headlines scare visitors. Cancellations are through the roof to levels not seen since the attacks on 9/11/2001. Businesses across the island are feeling the effects of the flamboyant headlines. They are worried about the bottom line and say they might have to start considering layoffs.
- Cruise liners are starting to cancel stops on the Big Island and redirecting to other islands or spending outing days at sea.

Wednesday 5/16/18 – “Ashfall advisory canceled but scientists say more explosive Kilauea eruptions possible anytime”, “Authorities to try to kill Puna geothermal wells with cold water”, “Amount of ash in plume above Kilauea decreases”, “Ash plume erupts and recedes at Kilauea summit”:

- Ash from the Halemaumau crater rose as high as 30,000 feet.
- Fissure 17 produced lava flowing a little more than a mile that slowed on Tuesday.
- A new fissure opened, bringing the count to 20 in total.
- Highway 130 was reopened to residents. Plans to pave highway 137 or Beach Road were scheduled to commence.
- Officials continue to warn about gases and ashfall and advise residents across Hawaii island to “stay out of it” unless necessary.
- Aviation notices were upgraded from orange to red. Power disturbances may start to happen according to Hawaiian Electric Light Company.



## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Thursday 5/17/18 – “Lava leaves Leilani Estates looking like a ghost town”, “Earthquakes rattle summit Wednesday morning”

- Earthquakes at the summit on Wednesday caused more ash to be ejected into the air and opened cracks on Highway 11.
- A volunteer run relief station (Pu’uhonua) opened and was flooded with evacuees.
- Hawaii Volcanos National Park remains closed.
- Ige appoints Brig. Gen. Kenneth Hara to form a dual-status command joint task force
- 5-0 to deal with the eruption.

Friday 5/18/18 – “People airlifted out of area isolated by fast-moving lava”, “Before-and-after satellite images show major changes at Kilauea’s summit, scientist say”, “Morning eruption causes alarm about air quality and ash”, Puna and Kau residents receive donated masks to tolerate ashfall”

- Kilauea erupted early causing several schools to close on Thursday after dangerous volcanic gas levels were detected.
- Officials distributed protective masks in Puna and Kau areas.
- Fissure 21 opened on Thursday with a smoother, more fluid, and faster flowing lava.
- A new lava vent 22 was reported by civil defense officials.
- Officials handed out free masks to protect from particulate from ash plumes. The masks, however, were not for protecting against toxic volcanic gases.
- Some of the fissures continue to expand and widen, except for fissure 17 that slowed over the past two days.
- Another eruption is expected in the future since 6 inches in movement of the earth has occurred over the past 24 hours.
- Ige stated that work to pump water into wells and prepare iron well caps has begun at PGV geothermal plant.

Saturday 5/19/18 – “4 rescued by helicopter as lava cuts off access to about 40 houses”:

- New eruptions with fast flowing lava cut off 40 homes in remote areas.
- There were 4 people evacuated via helicopter.
- Fissure 22 opened on Friday.
- Fresh lava is surfacing as it pushed lava from decades ago out of the earth. Scientists predict that the new lava will be able to cover much more land in less time.



*Lava flows from fissures 16-20. Direction of lava flow is from center to the left of photo. Photo taken on May 19, 2018 courtesy USGS.*

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

- The paving of highway 137 was completed Friday.
- A 41<sup>st</sup> structure (a home) was destroyed on Friday.

Sunday 5/20/18 – “New lava flow approaches Puna geothermal plant”:

- Two more lava flows are entering the ocean in Lower Puna.
- A small lava flow has started to move in the opposite direction from the lava river pouring into the ocean along the Puna coastline.
- Brush fires erupted on Saturday forcing evacuation of residents along Kamaili Road. The first report eruption-related injury occurred when a person’s lower leg was shattered by lava splatter.
- As of Saturday a total of 44 homes have been destroyed.
- On Friday, scientists determined that a new form of lava had emerged from fissure 20. The new lava is generally fresher, hotter, and faster.
- The number of fissures stands at 22.

Monday 5/21/18 – “Lava destroys warehouse near geothermal site; company says worries over lava encroachment overblown”, “Big Isle leads nation in sulfur dioxide emissions”:

- PGV indicates lava flow on the Lower East Rift Zone dwarfs any emissions that could result from a breach of the geothermal wells.
- USGS has crews at PGV to monitor the flow of lava near the 815-acre property.
- Most of the lava from Fissure 22 is flowing to the ocean. However, some the lava from this fissure is flowing in the opposite direction towards PGV.
- EPA attributes Hawaii County to have the highest 1-hour rate of sulfur dioxide in the U.S. for 2016.
- EPA installed 8 new air quality monitoring stations in public places, increasing the total to 13 stations on the island.
- Concerns about air quality arise as lava flow and laze (lava haze) continues. Laze results from hot lava coming in contact with cold seawater, producing a white plume of steam with hydrochloric acid and glass particles.



*Fountaining lava from fissure 22. Picture was taken on May 21, 2018 courtesy of USGS.*

## Kilauea Volcanic Eruption Events (Summary of Honolulu Star-Advertiser Articles)

Tuesday 5/22/18 – “Lava destroys warehouse near geothermal site; company says worries over lava encroachment overblown”, “Big Isle leads nation in sulfur dioxide emissions”

- EPA designates Hawaii County with the highest 1-hour sulfur dioxide level in the U.S. for 2016.
- EPA installed 8 new air quality monitoring stations which increased the total to number of stations to 13 on the island.
- Concerns about air quality related health issues arise as the lava flow continues and laze (lava haze) continues to fill the air. Laze results from hot lava coming in contact with cold seawater, producing a dense white plume of steam laced with hydrochloric acid and glass particles.
- No new fissures, the number stands at 22.



*Picture showing blue flames of methane gas burning from cracks along Kahukai Street. When hot lava buries plants and shrubs, methane is produced from the burning vegetation. Photograph taken on May 22, 2018 courtesy of USGS.*

Wednesday 5/23/18 – “Tourist arrivals up on Hawaii island in May despite Kilauea’s eruption”, “Kilauea glows with blue light from methane flame”:

- Ash plumes are reported from Kilauea as high as 8,000 feet.
- Blue flames at the Kilauea Volcano eruption are seen from methane as a result of lava that covers and burns plants and trees.
- Lava has been pouring down the volcano and into the ocean miles away.

Friday 5/25/2018 – “Explosions produce ash cloud that rose 11,000 feet”, “Third lava flow reaches ocean as Kilauea keeps pumping”

- Ash plumes are reported from Kilauea as high as 8,000 feet.
- A third lava flow was entering the ocean in Lower Puna creating laze.
- Fountains of lava erupt from fissures 5, 6, 13, 19, and 22.
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Monday 5/28/18 – “Volcano park closed for record stretch due to Kilauea eruption”, “Fast moving lava shuts down highway near Leilani Estates”,

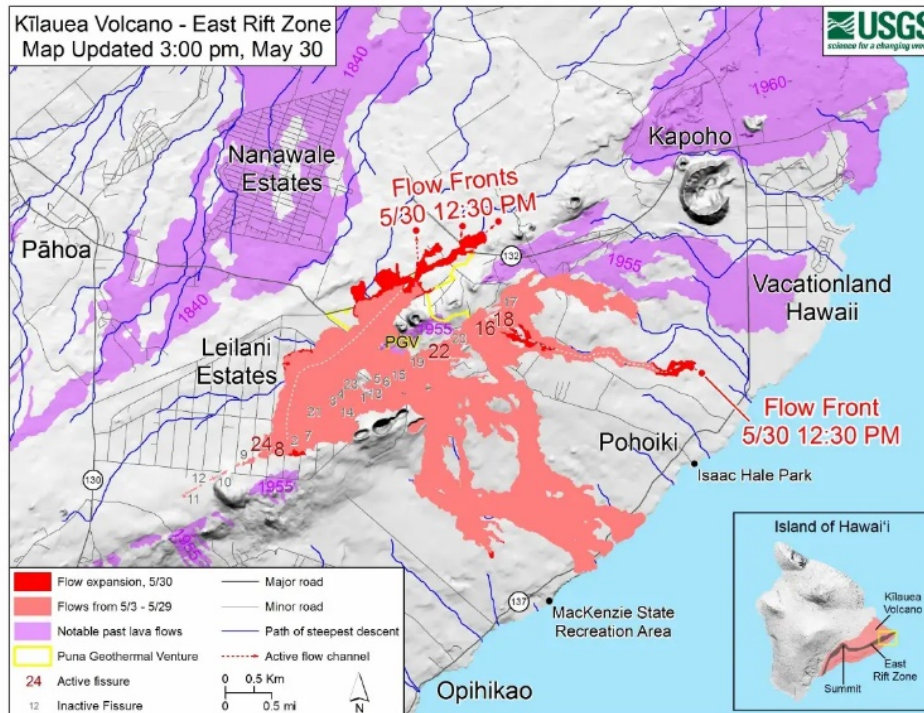
- Fissure 8 is fountaining lava as high as 200 feet. This lava is flowing to the northeast.
- A 4.4 magnitude earthquake hit the Hilina region of the Kilauea Volcano.
- Ash continued to erupt from the Halemaumau crater intermittently.
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Tuesday 5/29/2018 – “‘Your are at risk of being isolated,’ Civil Defense warns residents near Highway 132 as lava advances”, “Holdouts warned to prepare to flee fast-moving lava on short notice”:

- Pele’s Hair and other light weight volcanic glass are falling from Fissure 8.
- The lava flow from fissure 8 has been clocked at up to 200 yards per hour.
- Fissure 18 lava flow remains constant at less than 100 yards per hour and moving toward Highway 137.

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

- A 4.4 magnitude earthquake hit the Hilina region of the Kilauea Volcano.



USGS map showing location of fissure in order of occurrence, past and present lava flows, and PGV location as of May 30, 2018. Past lava flows with dates are shown in violet. Lava flows in May 2018 are shown in pink. Lava flow expansion is shown in red.

Thursday 5/31/2018 – “Residents of Lower Puna who do not evacuate today risk being stranded”, “Lava threatens a key escape route, forces evacuations”, Lava scientists’ drone guides lost resident through jungle”:

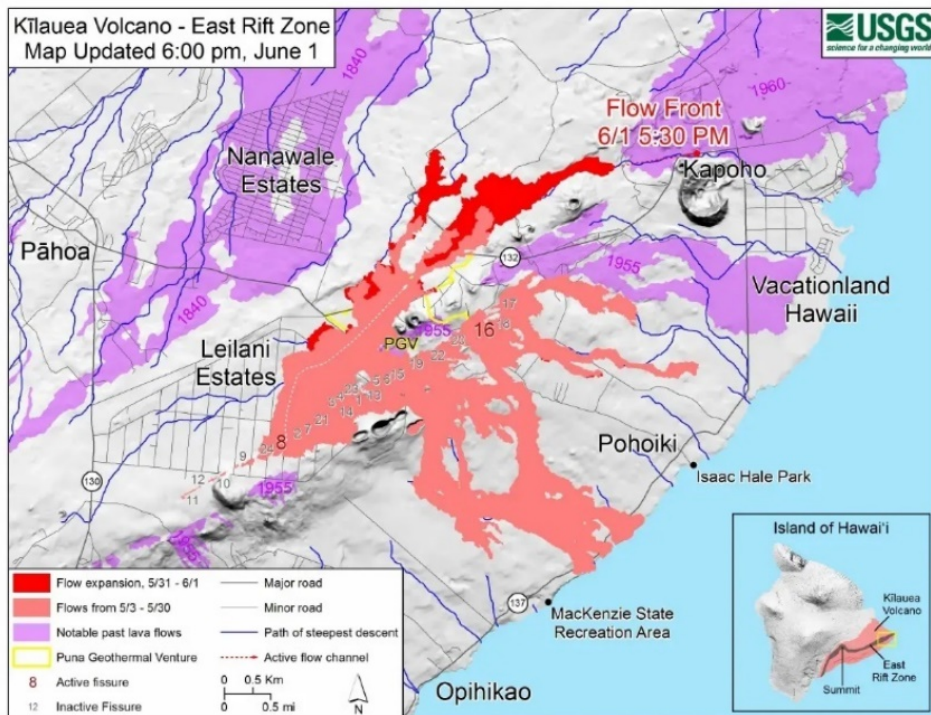
- Fissure 8 continues to produce lava fountains up to 260 feet high.
- Magma has been passing under Highway 130 which remains open for traffic.
- About 75 homes have been destroyed by lava.
- Fissure 8 is very active and is producing large flows.

### June 2018

Friday 6/1/2018 – “Emergency lava evacuation routes to be completed Saturday”, “Lava burns 2 buildings at Puna Geothermal plant”, “Evacuations continue as lava flow front splits into two lobes”, Leilani Estates lava might not be part of the eruption that began in 1983, scientists say”:

- An emergency route connecting Kalapana to Highway 11 is expected to be completed by Saturday if Highway 130 is cut off by lava.
- Highway 130 remains open.
- Lava has burned down a substation and warehouse for a drilling rig at the PGV plant.
- The Leilani Estates event that began May 3 appears to have diverted magma from the Puu Oo vent.
- According to USGS the Puu Oo eruption ranks the longest outpouring of lava from Kilauea Volcano’s East Rift Zone in more than 500 years.

Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)



USGS map showing location of fissures in order of occurrence, past and present lava flows, and PGV location as of June 1, 2018. Past lava flows with dates are shown in violet. Lava flow expansion is shown in red.

Saturday 6/2/2018 – “Big Isle mayor envisions ‘whole new community’ for Puna; crews work to open new evacuation routes”:

- Lava flow from fissure 8 has been moving from 70 to 120 yards per hour.
- 87 homes have been destroyed.

Sunday 6/3/2018 – “Big Isle mayor envisions ‘whole new community’ for Puna; crews work to open new evacuation routes”:

- Lava from fissure 8 continues to enter Kapoho Bay causing a laze plume.
- The number of homes destroyed is now at 117.

Monday 6/4/2018 – “Hawaii Volcanoes National Park’s most important facility damaged by quake”, “Kilauea eruption kills up to half of Big Isle forest reserve”, “Lava nears more coastal houses; earthquake launches ash plume 8,000 feet”:

- A magnitude 5.5 earthquake on Sunday cracked the park’s visitor overlook deck.



Lava entering Kapoho Bay causing laze. Photograph taken on June 4, 2018 courtesy of USGS.

### Kilauea Volcanic Eruption Events (Summary of Honolulu Star-Advertiser Articles)

- Fissure 9 is starting to emit sulfur dioxide.

Tuesday 6/5/2018 – “Kilauea lava inundates Kapoho Bay”, “Kilauea eruption harms up to half of Puna’s Malama Ki forest reserve”:

- Molten rock is being expelled from fissure 8 at an estimated rate of a few hundred cubic meters per second primarily from vent 8 that is located about 3 miles from the bay.
- DLNR indicates that more than 200 acres of the Malama Ki Forest Reserve have been damaged by wildfires caused by the lava flows.

Wednesday 6/6/2018 – “Lava fountains reach up to 230 feet overnight at fissure 8”:

- Fissure 8 remains very active.
- An ash plume at Kilauea summit reach some 10,000 feet.
- Lava has completely filled Kapoho Bay.

Thursday 6/7/2018 – “New coastline emerges as Kilauea pumps more lava to the sea”, “Kilauea summit blast sends ash soaring; total of homes likely to jump by hundreds”,

- Lava from Kilauea Volcano has created about a mile of new land.
- The lava vaporized Hawaii’s largest freshwater lake (Green Lake) that is hundreds of feet deep in some places.
- The latest count of homes taken by lava has increased to 130. However, this count is expected to increase since hundreds of homes are believed to have been destroyed in Vacationland and Kapoho Beach.
- The mayor indicated that more than 600 homes have been destroyed since early last month.

Friday 6/8/2018 – “Hawaii island mayor ‘positive’ as state covers county lava relief expenses”,

- The number of homes lost range from around 130 at Leilani Estates and Lanipuna Gardens, to about 160 at Vacationland, to about 320 homes at Kapoho Beach.

Monday 6/11/2018 – “Another moderate quake, explosion shake Kilauea summit”:

- A magnitude 5.3 earthquake occurred at the Kilauea summit.
- Fissure 8 continues to expel lava that is entering the ocean at Kapoho and producing laze.
- Lava flows have covered more than 5,000 acres.



*Aerial view of lava fountaining and flowing out of fissure 8. Photo taken June 11, 2018 courtesy of USGS.*

### Kilauea Volcanic Eruption Events (Summary of Honolulu Star-Advertiser Articles)

Friday 6/15/2018 – “Heavy vog covers Hilo and interior of Big Island”, “Kilauea eruption is classic example of ‘gentle’ volcano”, Ashfall, vog lowers air quality for residents of Ocean View”:

- Lava is still fountaining from Fissure 8.
- Fissures 16 and 18 continue to ooze lava.
- There are two types of volcanoes designated either as explosive or gentle.
- Kilauea is designated a gentle volcano (shield volcano).
- The new vents have been producing 20,000 tons of sulfur dioxide a day that is more than four times that from the summit’s Halemaumau lava lake in April according to USGS.

Wednesday 6/20/2018 – “Lava output far outpaces previous eruptions”:

- The current Lower East Rift Zone eruption has put an estimated 145 million cubic meters of lava over 47 days in comparison to 81 million cubic meters to an 88-day event in 1955 and 122 million cubic meters from a 37-day event in 1960.



*Picture of lava flow from fissure 8. Picture taken on June 21, 2018 courtesy of USGS.*

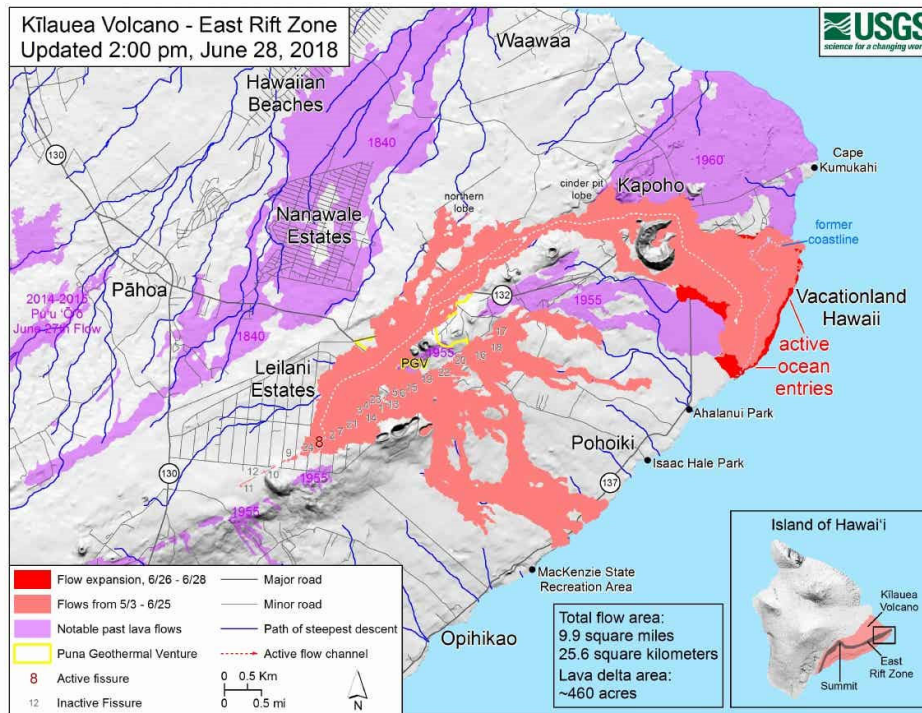
Sunday 6/24/2018 – “Lava has blocked road access to favorite shoreline sites”, “Explosion shakes Kilauea’s summit”, “Volcanic activity destroying marine and forest preserves”:

- As of Saturday, 637 homes have been destroyed and lava has covered about 6,144 acres of land.
- An explosive collapse at the summit of Kilauea Volcano caused plume of steam that was about 200 feet high.
- Lava from fissure 8 continues to flow through a channel leading to the Ocean at Kapoho.
- HVO report gas emissions from fissure 8 and laze at ocean entry remain very high.
- Steady lava flow from fissure 8 has filled at least 370 acres of ocean.



*For this picture of lava flow, HVO geologists noted that fissures 6, 13, and 22 were still erupting with two channels of flow reaching the ocean. Photo taken on May 24, 2018 courtesy of USGS.*

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)



USGS map showing location of fissures in order of occurrence, past and present lava flows, and PGV location as of June 28, 2018.

Sunday 6/29/2018 – “Lava has blocked road access to favorite shoreline sites”, “Volcanic activity destroying marine and forest preserves”:

- Fissure 8 continues to be active and feeds a lava channel that leads to the ocean.
- There is also a small flow of lava from Fissure 22.

### **July 2018**

Tuesday 7/24/2018 – “Lava flow from fissure 8 might go on for months or years”:

- The Kilauea eruption could continue for months or years.
- By the end of June, fissure 8 developed a spatter cone about 180 feet high that continues to feed an 8-mile-long channel to the ocean.
- The depth of Halemaumau Crater has more than tripled and the width has more than doubled.

### **August 2018**

Tuesday 8/7/2018 – “Kilauea eruption activity slows, ‘but it’s not over’”, “Volcanoes National Park remains closed as Halemaumau Crater continues to grow”:

- Eruption activity has significantly decreased from the Kilauea summit and fissure 8 according to HVO.
- The Halemaumau crater has increased in depth from once being 280 feet deep to now more than 1,500 feet deep in places. The crater’s volume has increased to 800 million cubic meters.



## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Saturday 8/18/2018 – “Lava insurance paying off for Puna geothermal plant owner”, “Big Island residents hopeful pause in Kilauea Volcano flow will last”:

- PGV has received \$7.2 million from insurance for a drilling rig destroyed by the lava.
- Lava covered three of six PGV energy production wells. The lava also burned a substation and adjacent warehouse that housed the drilling rig.
- All roads leading to PGV have been damaged by lava. As indicated by the Big Island mayor, roads will be fixed after a minimum of six months lava inactivity.
- The threat from Kilauea was downgraded from a “warning” to a “watch” after three weeks of decreasing activity.
- Lava stopped pouring into the ocean as of August 6, 2018.
- A small pond of lava remained in fissure 8 and the cooling lava was solidifying.
- Lava from Kilauea produced 24 fissures, covered over 6,000 acres, and destroyed over 700 homes.

Thursday 8/23/2018 – “Volcanoes park reopening good news for Big Island”:

- Reopening date for Hawaii Volcanoes National Park is set for September 22.
- Park officials are trying to locate a viewing area where changes can be seen at the Halemaumau Crater.
- The Halemaumau Crater depth is over 1,200 feet which is four times more than before and its diameter has more than doubled.

### **September 2018**

Wednesday 9/5/2018 – “Hawaii tourists and locals risk fines, jail time to get a closer look at Kilauea lava”:

- USGS reported only “weak” lava activity with none beyond the walls of fissure 8.
- The “First Bay” surf spot is now a beach of black sand created when lava reached the ocean and shattered.
- 

Tuesday 9/25/2018 – “Vog takes a breather from Hawaii skies”:

- Kilauea Volcano not emitting the high levels sulfur dioxide as it was in 2007.
- The lower volcanic emissions reduce the formation of vog (volcanic smog) that occurs when sulfur dioxide mixes with moisture and particulates in the air.
- HVO reported that sulfur dioxide from Kilauea has been under 1,000 metric ton per day level which is below the typical level recorded of around 5,000 metric tons per day.

### **December 2019**

Tuesday 12/3/2019 – “Recently formed lake in Halemaumau Crater the largest in at least 200 years”:

- The 529 foot long lake at the bottom of Halemaumau Crater is the largest body of water inside the crater for the past 200 years.
- The lake is now 60 feet deep and can rise another 150 to 180 feet before reaching the water table.

Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)



*View of the Halemaumau Crater at Kilauea's summit that continues to slowly rise. Photo taken November 21, 2019 courtesy USGS.*



*Closeup view of water at the bottoms of Halemaumau Crater. Photo taken October 26, 2019 courtesy NPS.*

**December 2020**

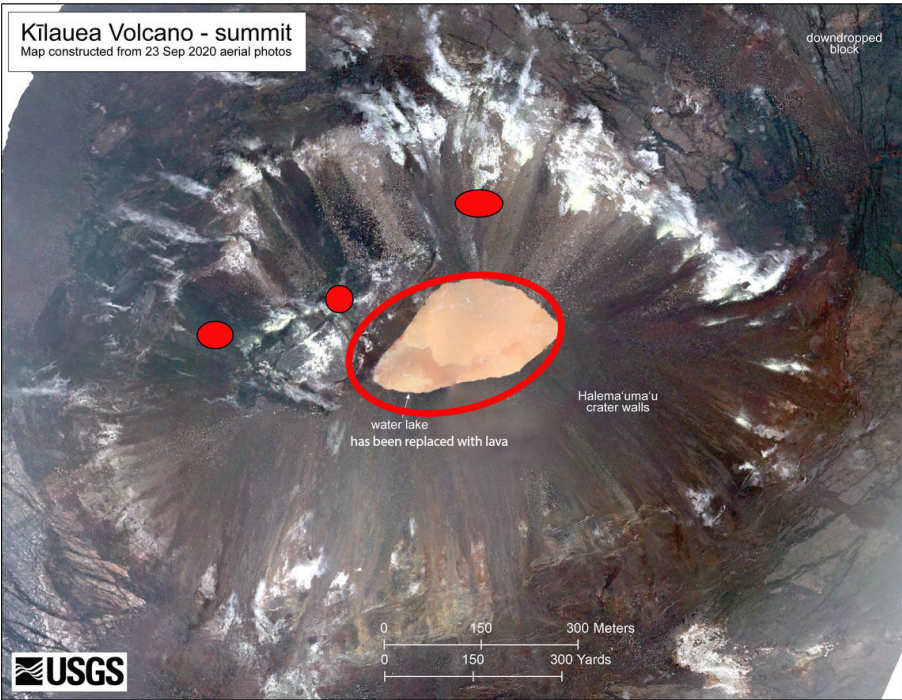
Monday 12/21/2020 – “No threat to public as Kilauea volcano eruption inside Halemaumau Crater stabilizes”:

- On December 20<sup>th</sup>, just after 9:30 PM HST, lava began to pour from three fissure vents inside the crater of Kilauea.
- Ashton Flinders, a research geophysicist with the USGS, said three fissures opened on the walls of Halemaumau. “They started passively and effusively pouring lava into the water lake. The water lake quickly evaporated from all of the heat.”
- The northern fissure was producing the tallest lava fountain at roughly 165 feet



*Image, captured from nearby webcam, of Kilauea erupting on December 20<sup>th</sup>, 2020. USGS Hawaiian Volcano Observatory/Public Domain.*

Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)



*December 28<sup>th</sup>, water lake has been replaced with lava, from three surrounding fissures. USGS/Public Domain.*



*At approximately 4:30 am HST on December 28<sup>th</sup>, HVO field crews measured the lava lake as 179 m (586 ft) deep. USGS Hawaiian Volcano Observatory/Public Domain.*

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Tuesday 12/22/2020 – “Halemaumau lava lake continues to rise; Hawaii Health Department warns of vog”:

- Eruptive activity at Kilauea’s summit may cause increased levels of vog and sulfur dioxide across the state. The Department of Health warns that it could affect respiratory health, especially in those who are sensitive to it.
- Some areas downwind of the summit, particularly Pahala and Ocean View, have experienced increased levels of sulfur dioxide.



*January 31<sup>st</sup>, eruptive activity continues in Halemaumau crater. The active surface lava remains largely confined to the western (left) portion of the lava lake. Lava continues to erupt from a vent on the northwest side of the Halemaumau crater, but is confined to this area. The crater is filled with approximately 213 m (699 ft) of lava, indicating that the level is still rising slowly. Recent sulfur dioxide emission rates from January 23, 2021 are approximately 2,200 tons per day. This is lower than rates from the pre-2018 eruption period, when the emission rates were between 3,000 and 6,500 tons per day. USGS/Public Domain.*

### **May 2021**

Wednesday 5/26/2021 – “Kilauea volcano stops erupting after 5 months”:

- Eruption monitoring staff noticed that the crater wasn’t showing lava activity or glowing areas, indicating the end of the almost 7-month long eruption.

### **September 2021**

Wednesday 09/26/21 – “Kilauea eruption resumes as lava returns to Halemaumau Crater”

- The volcanic eruption at Kilauea has resumed. The previous eruption had ended some months prior, in May 2021.
- The current eruption does not pose any threat to populated area of the Big Island, although the new eruption does increase volcanic emissions and vog.



*KWcam image taken on September 26, 2021. This image shows the eruption within Halema‘uma‘u crater at the summit of Kilauea. This activity is generating a lava lake that is slowly filling the crater. USGS Photo.*

**September 2022**

Thursday 09/29/22 – “Crater filling at Kīlauea is sometimes like pouring liquid into a mug, but more often it is like injecting haupia crème into a crispy malasada.”

- The 2018 eruption and subsidence of Kilauea crater created a deep pit crater, but the more recent eruption has again filled the crater.
- The images below, courtesy of USGS, show the crater level from September 2021 to September 2022.



*KWcam image taken on September 28, 2021, before the eruption began in Halema'uma'u on September 29, 2021. Several islands, including the one in the center of the crater that formed on December 20, 2020, are surrounded by younger lava flows erupted during the December 2020-May 2021 Kīlauea summit eruption. USGS photo.*



*KWcam image taken on September 27, 2022. The floor of Halema'uma'u has grown in area and elevation due to the ongoing eruption in crater. The island that formed on December 20, 2020, is surrounded by younger lava flows so what is seen on the surface of Halema'uma'u crater floor today represents the oldest and youngest deposits from these recent eruptions! USGS photo.*

**November 2022**

Tuesday 11/29/22 – “No danger yet as lava flows”

- The Mauna Loa volcano erupts for the first time since 1984.
- As of Monday 11/28/22, there were three main fissures between 1 and 2 miles long each, and fountains of lava as high as 200 feet.
- Although the lava flow is going in the direction of Hilo, at this time it is not estimated to have any direct impact on the public or property, other than ash fall in some areas.



*Aerial photo captured during an overflight of the Northeast Rift Zone eruption of Mauna Loa at approximately 5-6:30 p.m. HST on November 28, 2022. This photo is looking at the line of fissure vents erupting above 10,000 ft elevation on the Northeast Rift Zone of Mauna Loa. Lava flows being generated from the line of fissure vents are on the northeast flank of Mauna Loa. Image courtesy of Civil Air Patrol.*



## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)

Wednesday 11/30/22 – “Mauna Loa’s fiery show”

- Despite estimated emissions of 250,000 tons of SO<sub>2</sub> per day, air quality at state monitoring stations has been good.
- Lava continues to spew primarily from Fissures 3 and 4, and lava flows are moving towards the northeast at approximately 0.08 miles per hour



*This image, taken during an early morning overflight on 30 November 2022, shows Fissure 3, the dominant source of activity. As of 7 a.m. HST, the lava fountains are 20-25 meters in height (65-82 feet) and feed a lava flow moving to the northeast at ~130 meters per hour (0.08 miles per hour). Public domain.*

### **December 2022**

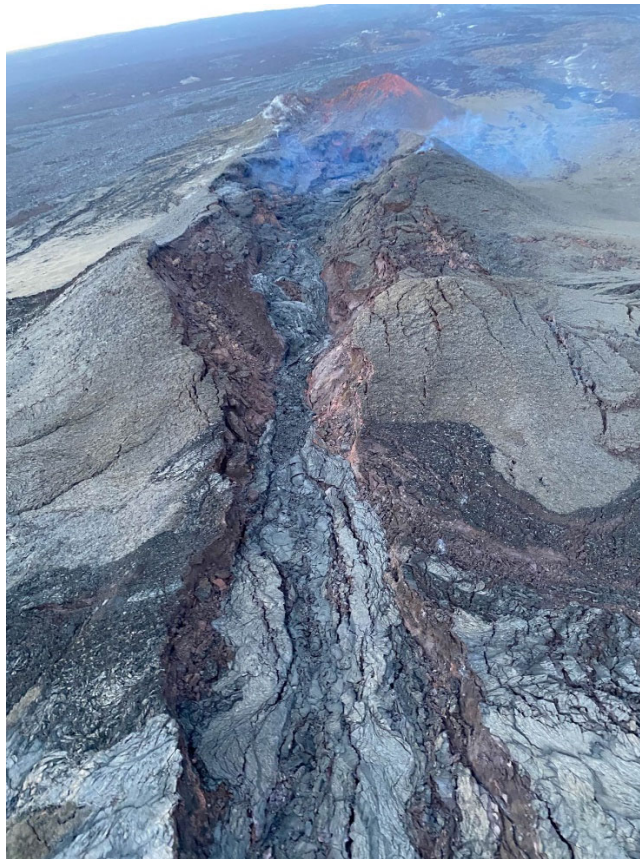
Wednesday 12/14/22 – “Hawaii island eruptions come to an end”

- Ken Hon, HVO scientist-in-charge said that almost no sulfur dioxide gas is being emitted from the volcanoes at this point, and there are few earthquake recordings.
- Although scientists are still recording steady inflation at the summit, the chamber is depressurized now and has begun slowly filling back up.

## Kilauea Volcanic Eruption Events (Summary of *Honolulu Star-Advertiser* Articles)



*Geologists conducted a monitoring overflight of Kilauea summit on the morning of December 10, 2022. They noted that the lava lake within Halema'uma'u crater was mostly solidified, though incandescence was visible. USGS image by J. Bard.*



*As of 7:00 a.m. on December 12, Hawaiian Volcano Observatory geologists observed only residual incandescence and no lava movement in the fissure 3 vent on the Northeast Rift Zone of Mauna Loa. The channels below the vent appear drained of lava and no longer feed the main flow front. USGS image by F. Trusdell.*

## **January 2023**

Thursday 1/5/23 – “Lava flows once again from Hawaii’s Kilauea volcano”

- Almost one month after the volcano’s most recent eruption ended, Kilauea is again spewing fountains of lava from the Halemaumau Crater.
- “Things can always change, but for now it’s just in the crater” – Matthew Patrick, HVO geologist



*View of the Halemaumau Crater from USGS's live stream video recorded on January 7th.*

## **March 2023**

- On March 7<sup>th</sup>, after 61 days of volcanic activity, the eruption paused, according to the USGS Hawaiian Volcano Observatory.