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Not My Fault: Mauna Loa revisited

Lori Dengler/For the Times-Standard
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Hawaii is one of the most interesting places in the world for geologists. Mother Nature is building and eroding landforms on a time scale that humans can appreciate. It's always a place of earthquake and volcanic activity but there are signs the activity level may be ramping up.

Mauna Loa is the largest active volcano on the planet. It is also the tallest mountain (from base to peak). It is not currently erupting but there are signs that status could change. The USGS Hawaii Volcano Observatory (HVO) monitors all volcanic areas in Hawaii. A dense network of instruments covers the Big Island and some adjacent offshore areas. A recent increase in seismicity has focused attention on Mauna Loa.

Seismometers can detect earthquakes less than magnitude 0 and can locate the depths within a few hundred feet. Since the USGS uses mean sea level as the reference level for earthquake depths, it can be a bit confusing to read that some quakes beneath Mauna Loa have negative depths. Mauna Loa's peak is 4.17 kilometers above sea level (2.6 miles). The shallowest earthquake in the past month is listed as -1.7 km. That means this earthquake was nearly 2.5 km beneath the summit, but just about a mile above sea level.

Other instruments measure the position of the ground surface. As magma moves at depth, the ground surface may swell or subside. GPS lines crisscross the summit and flanks. When the summit inflates, the lines stretch and get longer. Tilt meters measure the summit slope angle. As magma rises or drops, it changes the tilt. Both these measurements have indicated slow inflation over the past two years with rates increasing at the same time the seismicity jumped.

The USGS also monitors gas emissions. Magma is a complex mixture of gasses and molten rock. At depth, pressure holds these gasses in solution. As the magma moves upward and pressure decreases, some of the gas escapes. HVO measures carbon dioxide and sulfur dioxide emissions continuously from a station near Mauna Loa's summit.

I last visited Mauna Loa in this column in December 2020. My interest piqued because seismic activity increase in July 2019 lead the USGS to raise the Mauna Loa status from Green (normal background) to Yellow (Advisory).

The USGS uses colors to assess the status of US volcanoes. Green means no eruptive activity or signs that one is brewing. Yellow (elevated unrest) is characterized by an increase in earthquakes and/or gas emissions and means an eruption isn't imminent but it is worth watching closely. Orange is heightened unrest, or a minor eruption is underway and means the potential of a more explosive eruption. The highest level, Red, means a major eruption is imminent or underway.

Mauna Loa status is still at Yellow and there are no signs that a major eruption is about to happen. My interest was rekindled when a sudden increase in earthquake activity six weeks ago led the USGS to close the Mauna Loa summit area to visitors and Hawaii Civil Defense alerted citizens on the Island to be prepared to evacuate quickly if changes in volcanic status were observed.

Mauna Loa is a much bigger deal than neighboring Kilauea – both in size and in potential impacts. Kilauea erupts almost continuously. The longest eruptive period in its documented history lasted from 1983 and 2018. It took a 27-month nap and resumed in December 2020. The current activity is restricted to the Kilauea summit lake Halema'uma'u.

Mauna Loa takes a short-lived but much more powerful eruptive style. Erupting 12 times in the 20th century, the duration of each eruptive episode lasts only weeks or months. The most powerful recent eruption was in 1950. It lasted for 23 days but produced as much lava as four years' worth of the Kilauea rate.

The volume and rate of the lava production is only one part of the impacts equation. The second is topography. Lava erupting from the summit or flanks of Mauna Loa starts at much higher elevations and travels down steeper slopes than Kilauea. In 1950, It took only three hours for lava from near the Mauna Loa summit to reach the sea. It takes several weeks for Kilauea flows to travel a similar distance.

Hawaii Civil Defense has prepared maps of areas that could be overrun in a future Mauna Loa eruption. The highest risk areas are along the SW coast where lava flows could reach populated areas in as little as three hours. But many parts of the Island are at risk including the Kona coast and Hilo.

There are some similarities between planning for volcanoes and tsunamis. Both require getting out of harm's way to survive and may have a short time window to do so. Tourists are particularly vulnerable. Long term residents of Hawaii are familiar with volcanic hazards and (hopefully) know if they live or work in a lava-flow hazard zone. But tourists and new arrivals may know little about the hazard. Reaching transient populations on Hawaii or on California' North Coast is a challenge for both hazards.

There is no guarantee that the current increase in Mauna Loa earthquake activity or inflation rate will lead to a major eruption soon. Mauna Loa is a complex beast. During the late 19th through the mid 20th centuries, it erupted frequently. More recently, it has taken long snoozes – the long quiet between 1950 and the present punctuated only by the 1984 eruption. The recent unrest has not been accompanied by any significant changes in gas emissions.

Spikes in earthquake activity are signs that magma is moving but not that it will reach the surface. The earthquake rate was high in early February and then quickly diminished. It is looking like the late September spurt is also dying down. But the situation could quickly change. And if you are headed to Hawaii for a vacation, just remember that the islands owe their existence to volcanic activity and there is always a remote chance you may be an eyewitness to the next historic eruption.

Note: the Hawaii Volcano Observatory posts daily updates on Mauna Loa's status at https://www.usgs.gov/volcanoes/mauna-loa/volcano-updates

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Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times-Standard's. All Not My Fault columns are archived online at https://kamome.humboldt.edu/resources and may be reused for educational purposes. Leave a message at (707) 826-6019 or email rctwg@humboldt.edu for questions and comments about this column, or to request a free copy of the North Coast preparedness magazine "Living on Shaky Ground."