ABSTRACT FROM 18TH INTERNATIONAL VULCANOSPELEOLOGY SYMPOSIUM

PELE'S SURPRISE

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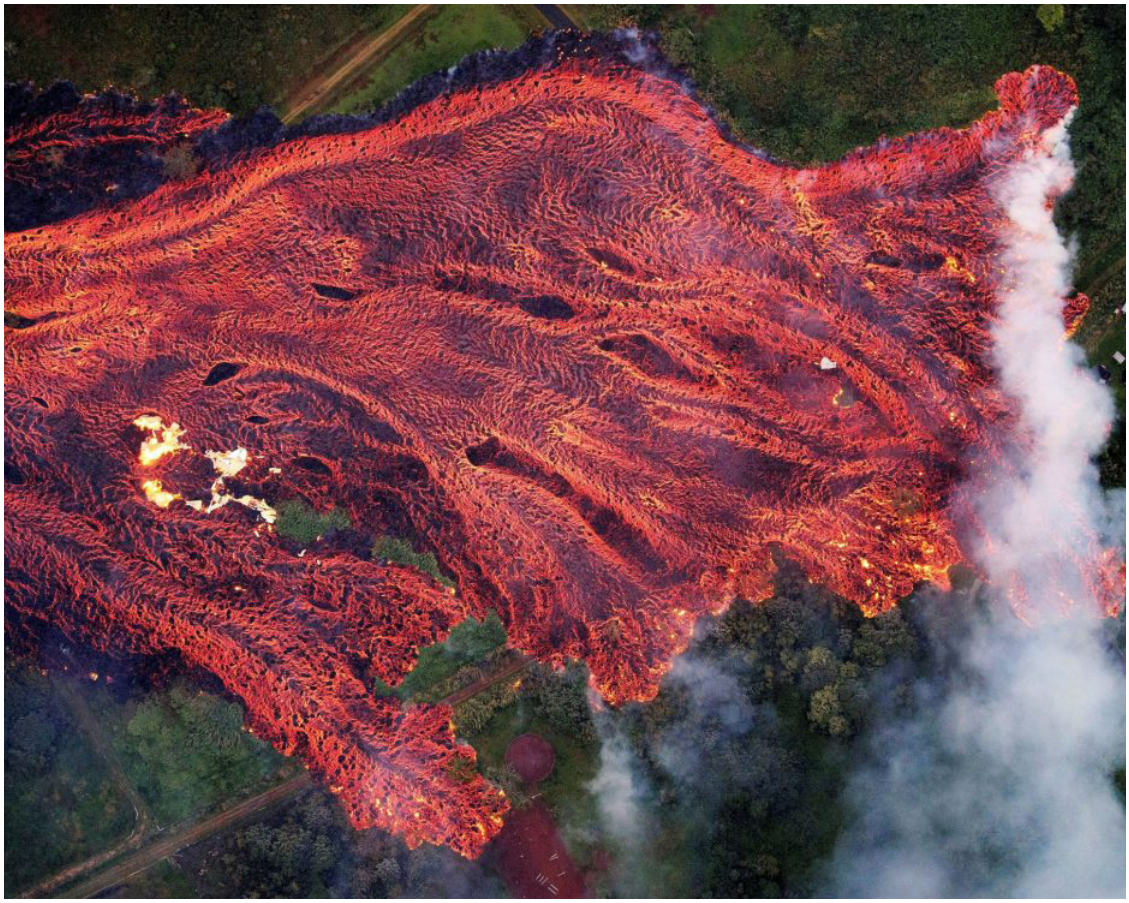
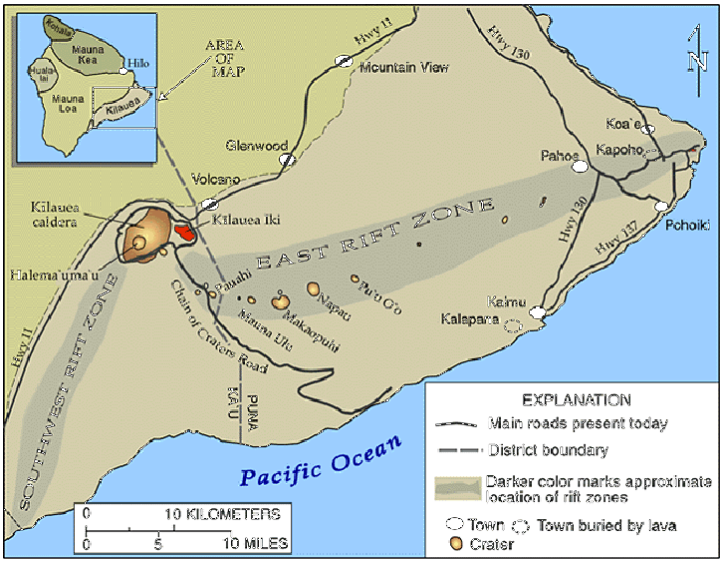
The 2018 eruption of Kilauea on the island of Hawai'i from May 3 to August 5 is considered to be the largest eruption of that volcano in at least two centuries, in terms of both a higher volume and flow rate.

In this paper, I will draw on information supplied by the Hawai'i Volcano Observatory to illustrate changes in three areas of the volcano that were enormously affected by the eruption, namely the summit caldera, the Middle East Rift Zone (MERZ) and the Lower East Rift Zone (LERZ).

Lava erupted in the Lower East Rift Zone (LERZ),about 12 miles from the summit, in a residential subdivision called Leilani Estates. In just a few months, the eruption spread about one cubic kilometer or more of molten rock over the lower Puna landscape, inundating homes, farms, businesses, roads, forests, shoreline and a lake. The eruption jolted the region with thousands of earthquakes (including Hawaii Island's largest in 43 years). The movement of lava from the summit to the LERZ resulted



"A View From Above" shows the catastrophic force of a fast-moving lava flow from Hawai'i's Kilauea volcano, seen here on May 19. The eruption destroyed nearly 700 homes and displaced thousands. PC: Bruce Omori—Paradise Helicopters/EPA-EFE/Shutterstock



in 62 caldera collapse events at the summit, bringing the base of the crater to a level half way between the summit and sea level and leaving an enormous void.

Approximately a quarter of the amount of lava produced during the 35-year Pu'u O'o eruption in the MERZ was expelled in a matter of months in the LERZ.The voluminous activity was driven by several factors: a pressurized pre-eruption state at the summit and at the MERZ, and relative low elevation of the vents in the LERZ. This eruption again demonstrated a correlation between the magnitude of total co-eruptive summit deflation and vent elevation, with the greatest summit deflation coinciding with the lowest-elevation vents. Additionally, the summit collapses, which occurred as magma was drained from the reservoir, also could have driven magma to the vents.

This eruption was also famously destructive. The lava from 24 fissures covered 13.7 square miles, destroyed 716 homes, partially buried the Puna Geothermal Venture power plant, isolated 1,600 acres of farmland and caused damage by one estimate of more than $800 million. Over the four-month disaster, more than 2,000 residents were evacuated. The Hawaii Volcanoes National Park was closed, and the tourist industry was hard hit.

With each large earthquake, ground shaking causes additional collapse within the Pu‘u ‘Ō‘ō crater, sending a plume of reddish-brown ash skyward. The size and vigor of a plume depends on the size of the earthquake and subsequent collapse. This roiling ash plume followed the magnitude-6.9 earthquake on May 4. Much of the rock within the crater is rust in color, which is a result of heavy alteration by acidic volcanic gases. When the rock is pulverized by a collapse event, the resulting ash plume is pink to reddish-brown ash plume. USGS photo by T. Neal.