

Gauer Pasqualon, N., Houghton, B.F., Patrick, M.R., Llewellyn, E.W. and Tisdale, C.M., 2023, December. Onset and Evolution of the Mauna Loa 2022 Summit Lava Fountaining. In AGU Fall Meeting Abstracts (Vol. 2023, No. 21, pp. V33F-021).

ABSTRACT

The Mauna Loa 2022 eruption started on November 27th in Moku'āweoweo (summit) caldera, and then migrated to the Northeast Rift Zone, producing lava that covered 43 km² over thirteen days. For the first time, webcam and high-resolution videos recorded the onset and evolution of a Mauna Loa eruption, offering the opportunity to quantify eruption parameters and to infer its subsurface patterns. Video analysis was performed on Hawaiian Volcano Observatory webcam videos for the first 6h 50 min of eruption, while it was still confined to the summit. Fountain heights and fissure lengths were initially measured in 31 frames using the software ImageJ. Four phases of the summit eruption were identified: Onset and early fountaining (P1), waxing (P2), steady (P3), and waning phases (P4). Phase 1 (20 min) is characterized by the lateral propagation of a single SW-NE fissure segment (S1) at ~30 m/min rate, with steady fountains reaching up to 120 m height. In phase 2 (1h 17 min), fissure segments S2 and S3 developed at a rate of ~20 m/min, creating a total ~2.4 km long fissure composed by S1, S2 and S3. At this stage, fountains were steady, reached up to 47 m height and developed around two strong point sources. For the following 1h 40 min, no major changes were observed to the fissure and/or fountains behavior, characterizing steady phase 3. During phase 4 (3h 45 min), fountains were unsteady with maximum heights of 26 m, and the lengths of the fissure segments declined at a rate of ~6 m/min. By the end of P4, S3 is the only active fissure segment, heralding migration of magma to the northeast rift zone and marking the end of the summit eruption. The reduction of fountain heights with increasing width of the fissure system suggests that magma supply to the summit fissures was nearly constant from P1 through P3 and decreased only during P4. The point sources that developed in P2 indicate small-scale lateral changes to the bubble regime and magma flow path in the subsurface. In summary, video analysis proved an efficient tool to quantify early-stage eruption parameters and should be further explored for rapid response and to the fine-tuning of hazard mitigation plans.

Link: <https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1239823>